AUTOGUIDE EQUIPMENT

Operating Instructions

CFA Piling Rig

Autoguide Equipment
Stockley Road
Heddington
Nr. Calne
Wiltshire SN11 0PS
England
Tel: +44 (0) 1380 850885
Web Site: www.autoguide.co.uk

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These instructions give safety and operations information regarding the use of the Electric Piling Rig supplied by Autoguide Equipment. They contain the relevant information for products:

Product Code	Description	Max Torque *(Nm)*	Weight *(kg)*	Length *(m)*	Width *(m)*	Height *(m)*
48087	CFA Piling Rig 55kW 45kNm	45000	18000	10.3	2.8	3.5

To ensure optimum results when operating this equipment it is very important to read this manual carefully, the information will prepare you to do a better, safer job.

Before operating the machine you should familiarise yourself with the instructions in this manual. Incorrect use can lead to damage which is not covered by the Warranty Conditions. This may create a dangerous situation or lead to unsatisfactory results.

These operating instructions **MUST** always be made available to the person or persons operating this equipment.

To assist in the ordering of spares, or other communications with our company, the serial number of the relevant equipment supplied, has been recorded below for your information.

Model No:-

Serial No:-

Date of Delivery:-

CONTENTS

INFORMATION

Your Piling Rig has been individually built with great emphasis on quality, strength and simplicity of design and with routine care will give many years of trouble free operation.

The following instructions have been written to cover the machine. Care should be taken to ensure that you are referring to the correct section of your machine before carrying out any adjustments, or when ordering spare parts.

Like all mechanical products, regular cleaning, lubrication and maintenance will ensure a longer trouble free life. These instructions make no attempt to go beyond routine maintenance, and it is strongly advised that you contact your dealer should any major repairs become necessary.

Use only genuine service parts; non genuine parts may not meet standards required for safe and satisfactory operation.

Observe all safety information in the manual and on decals fitted to the machine and power unit.

Warnings

- Improper operation and maintenance of this machine can be hazardous and could result in serious injury of death.
- Operators and maintenance personnel should read this manual thoroughly before beginning operation and maintenance.
- Always keep this manual on the machine and be sure to read and understand it thoroughly before performing operation and maintenance.
- Some actions involved in operation and maintenance of the machine can cause serious accident of they are not done in the manner described in this manual.
- If this manual has been lost or has become dirty and cannot be read, request a replacement manual from Autoguide Equipment Ltd.
- If you lend this machine to another person, always have that person read the operation manual and make sure that they understand the content of the manual before starting operation. Be particularly careful to ensure that they follow the safety regulations when operating.

Safety Instructions

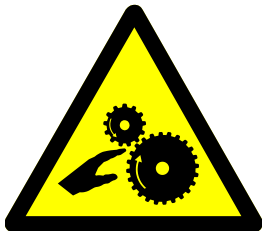
1. Read and understand this operator's manual prior to operating the machine and keep it in a convenient place for future reference.
2. Keep untrained personnel away from the machine whilst it is in operation.
3. Keep all guards and safety devices in place.
4. Do not operate machine with guards removed if possible dependant on working conditions.
5. Beware, pressured hydraulic oil can be very dangerous and can penetrate the skin - TAKE THE UTMOST CARE.
6. Keep hands, feet and loose clothing away from moving parts.
7. Always switch off the machine before making any adjustments or when carrying out lubrication and servicing.
8. Keep all nuts, bolts and fasteners tightened.
9. Check machine regularly for damaged or worn parts.
10. If the machine is left unattended ensure that the isolator is switched off, and the generator locked or disabled to prevent use by untrained personnel.

Daily Check Items

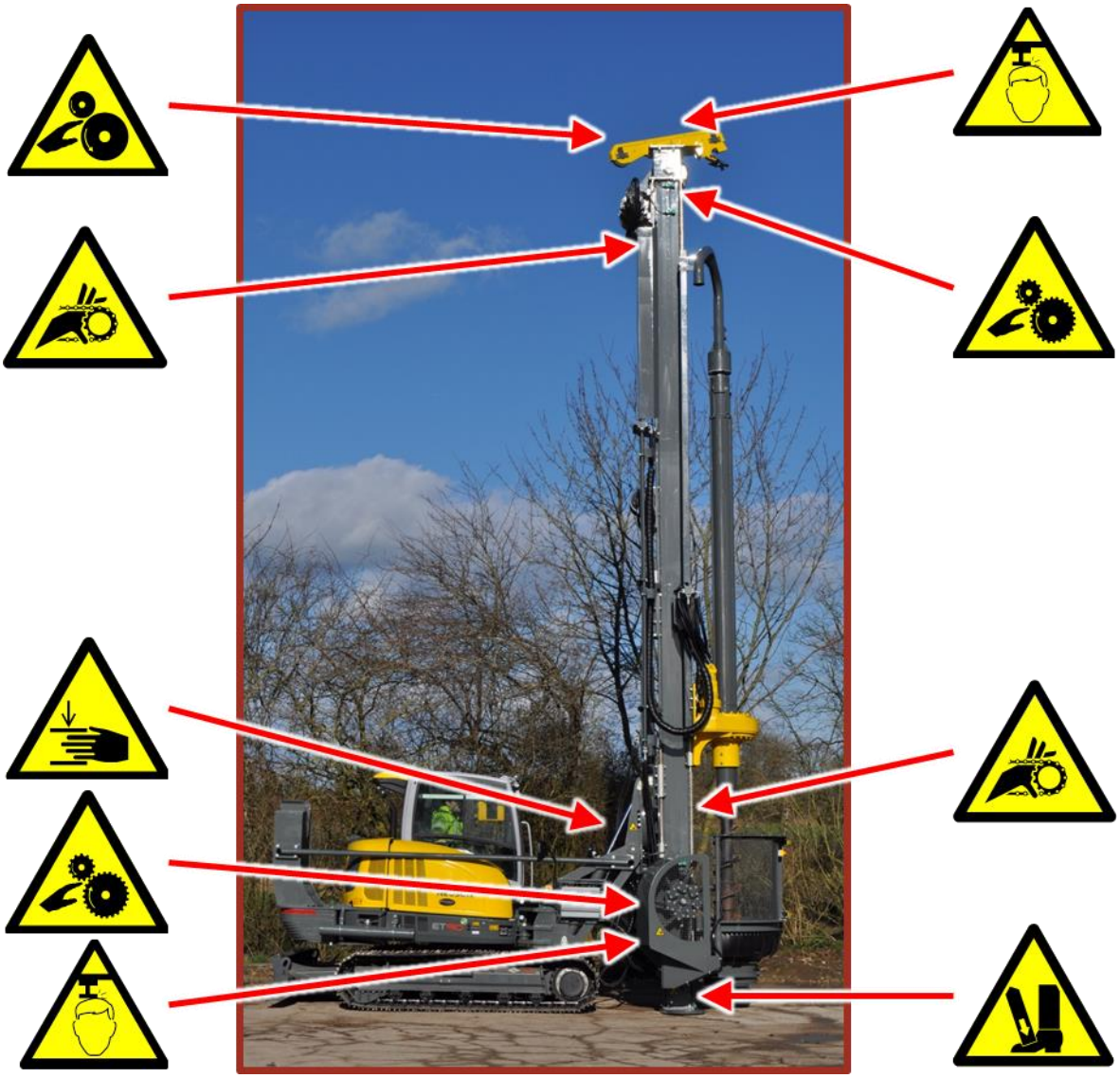
1. Checks that all nuts and bolts are secure, mounting pins are properly retained and all safety guards are in place. (All nuts and bolts should be checked after the first 10 hours of operation.)
2. Check the condition and security of any weight or attachment.
3. Lubricate all grease nipples.
4. Check the wear pad adjusters are tight and secure.

MACHINE SAFETY

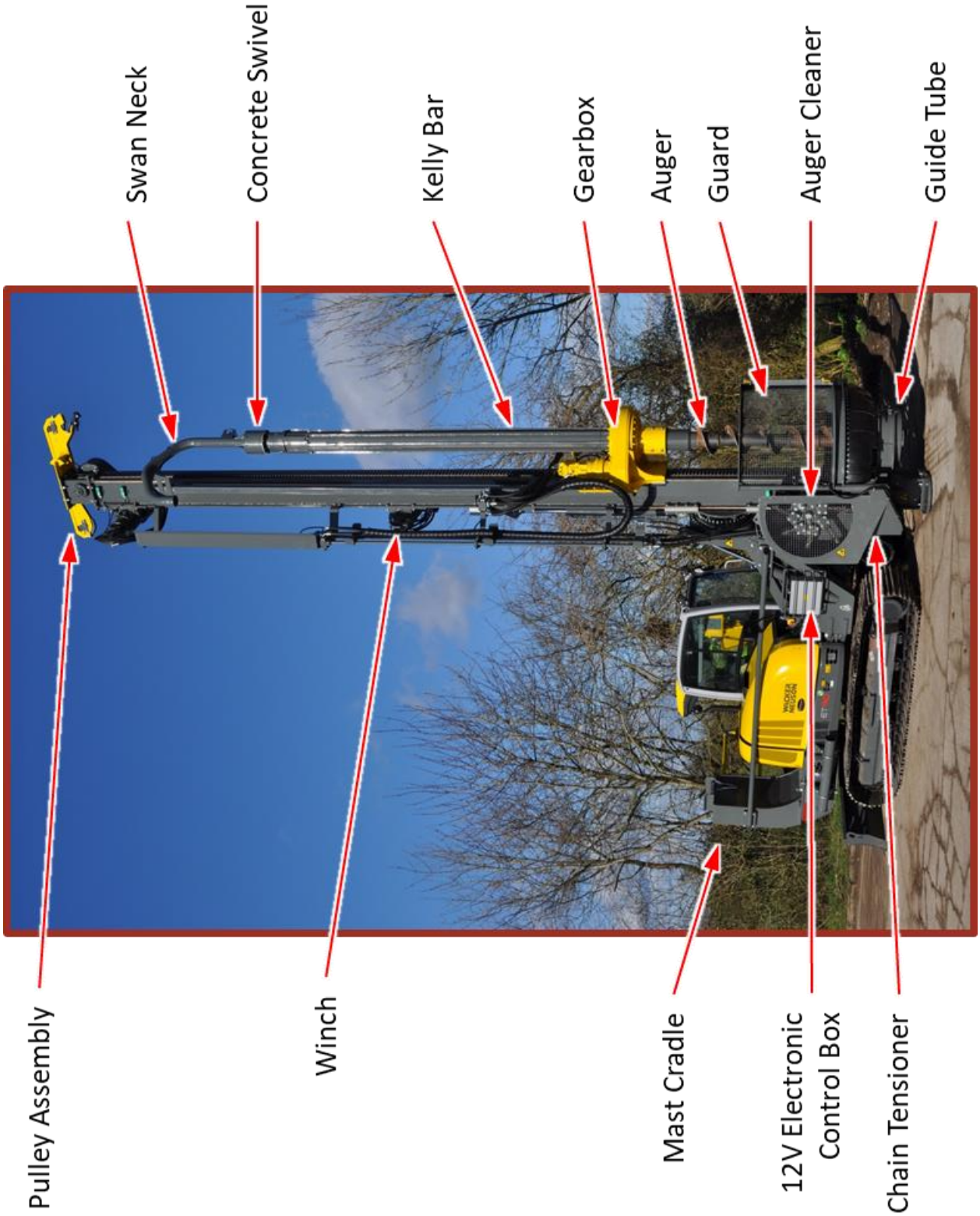
The rig is fitted with numerous safety stickers highlighting the potential dangers. Please take note of these warnings as they are there to protect from dangers.

Warning Sign	Definition
	Danger Moving Parts Can Crush And Cut.
	Danger Moving Pulleys. Can Crush And Cut.
	Danger Moving Chain. Can Crush And Cut.
	Crush Hazard. Keep Hands Clear Of Moving Parts.
	Crush Hazard. Keep Feet Clear Of Moving Parts.
	Risk of banging head. Be aware of low objects.

The placement of the safety warning signs are shown below. These locations are specific danger zones that the users need to be aware of, but are not alone in the risks posed by using the rig.

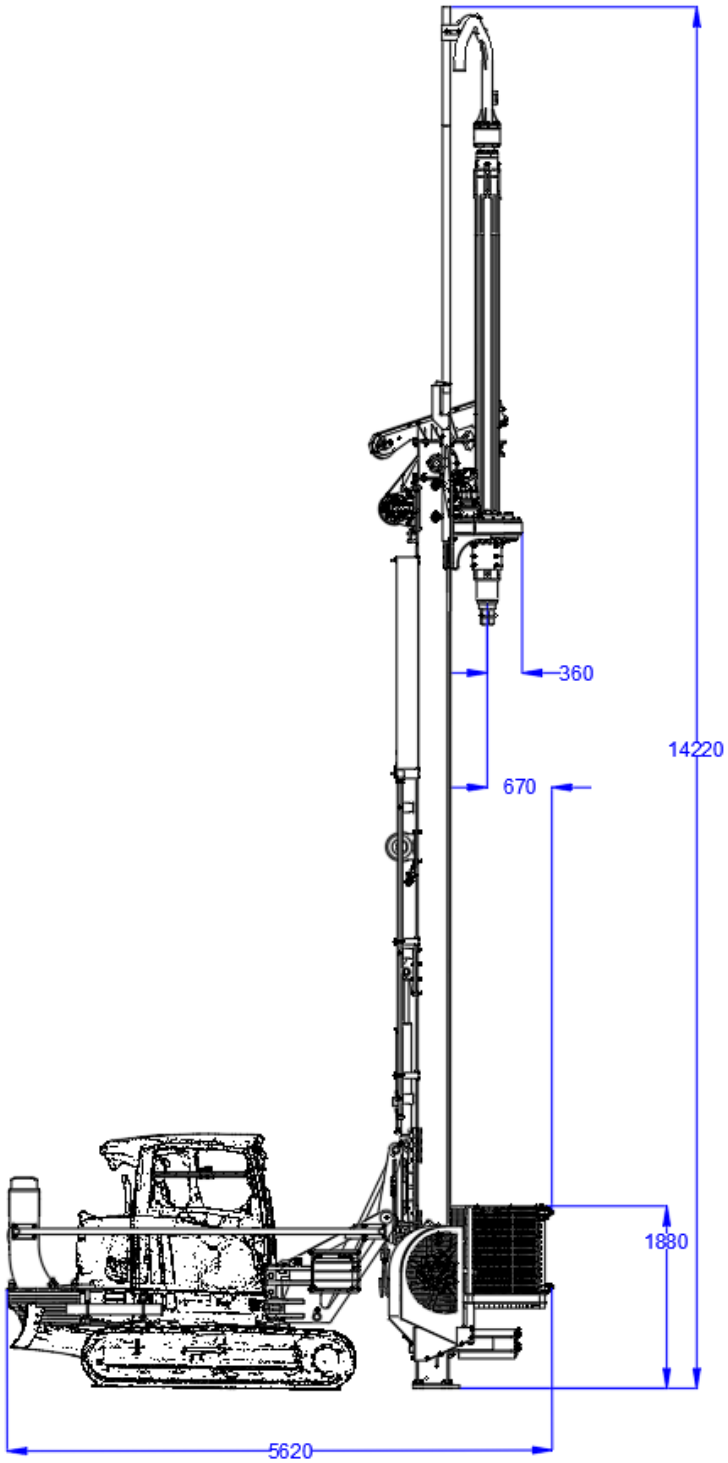


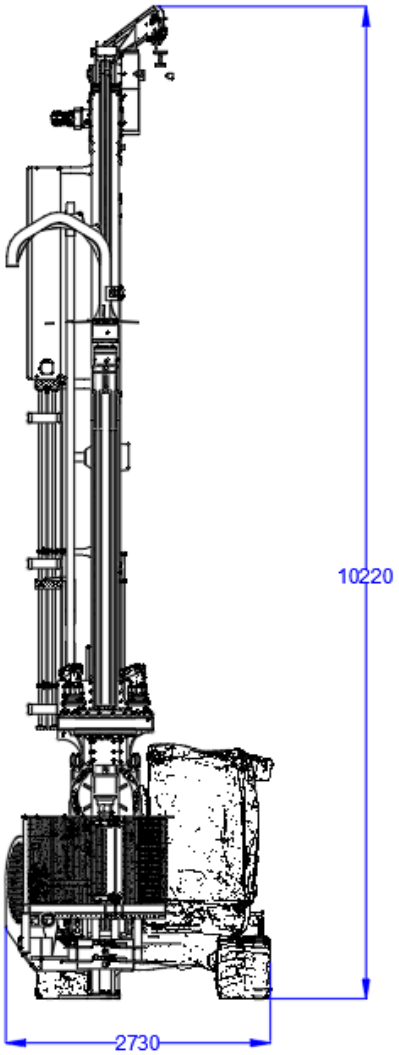
MACHINE FAMILIARISATION



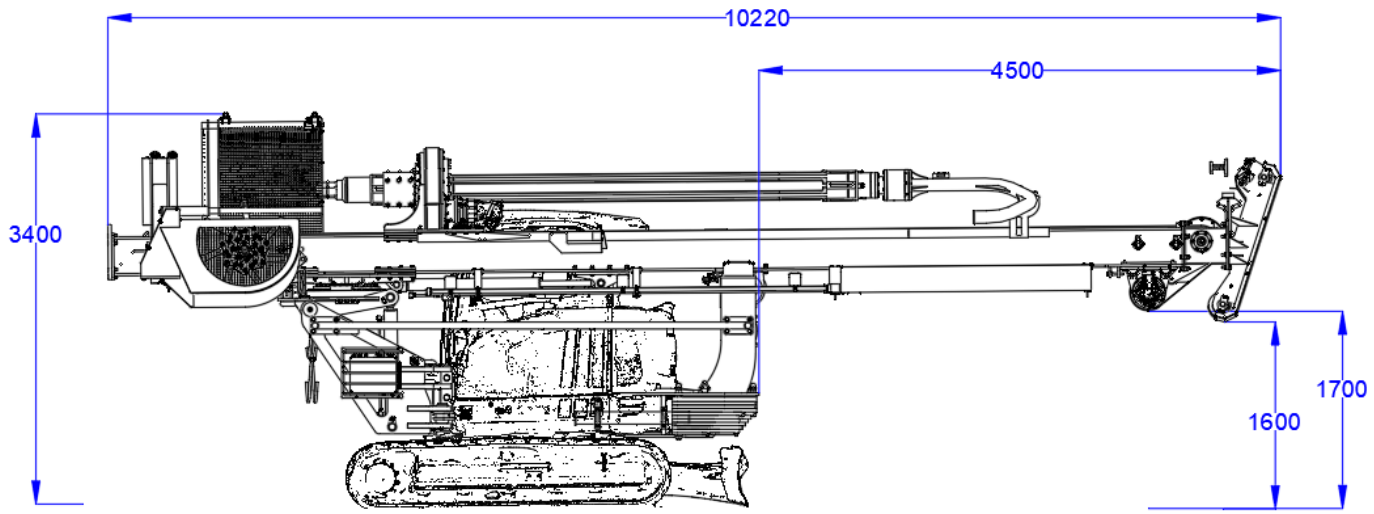
TECHNICAL DATA

Dimensions

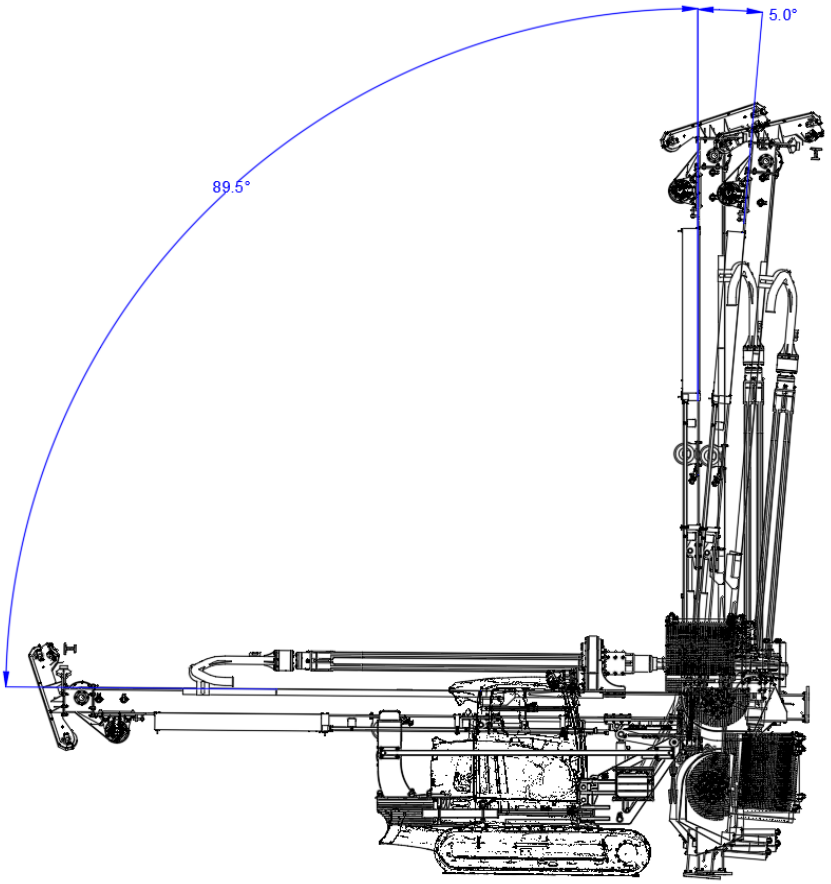


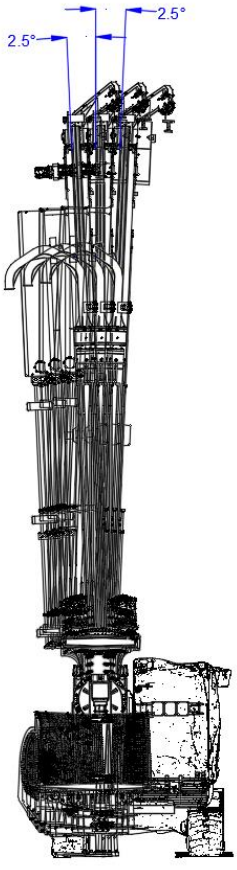


Transport Dimensions



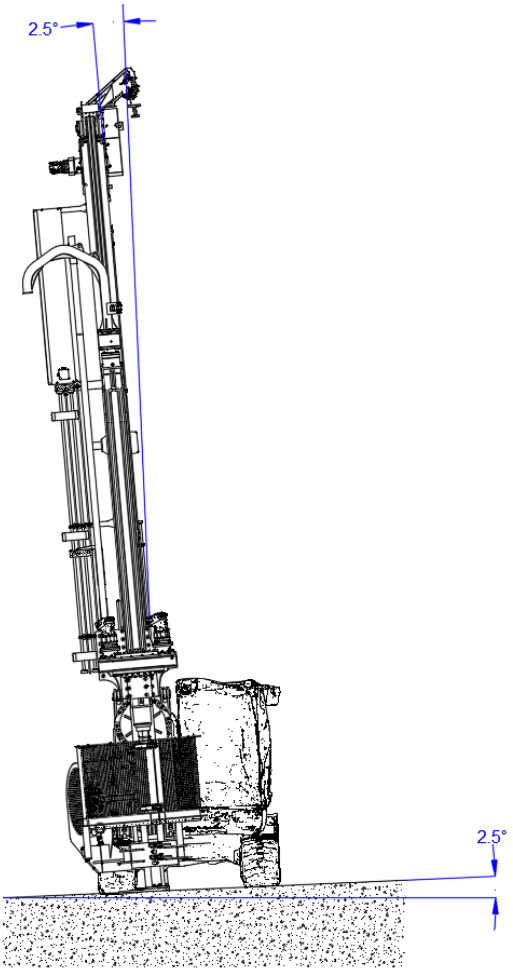
Freedom of Movement





Ground Conditions

The rig can be operated on a maximum slope of 2.5° when the mast tilt plane is perpendicular to the slope, with the mast leant over to the maximum extent of 2.5mm on the mast rotate function



MACHINE OPERATION

General Precautions

WARNING: Failure to follow these general safety precautions may lead to a serious accident.

Safety Rules

- Only trained and qualified personnel or personnel authorised by the company (or superior) can operate and maintain the machine.
- Follow all safety rules, prohibitions, precautions, procedures and instructions when operating or performing maintenance on the machine and pay careful attention to safety.
- Operating the machine when you are not in good physical condition reduces the power of judgment needed to avoid danger and leads to accidents.
- People in the following conditions should not operate the machine.
    - People who cannot operate normally because they are ill, or suffering from the effects of medication.
    - People who have been drinking
    - Pregnant women

Safety Features

- Be sure that all guards and covers are in their proper position. Have guards and covers repaired if damaged.
- Improper use of safety features could result in serious bodily injury or death.

Personal Protection

- Always wear properly fitting clothes which allow ease of movements.
- Avoid loose clothing, towels, jewellery and loose long hair. They can catch on controls or in moving parts and cause injury or death.
- Also, do not wear oily clothes; they can easily catch fire.
- Wear a hard hat, safety glasses, non-slip safety shoes and gloves when operating or maintaining the machine.

Unauthorised Modification

- Any modifications made without authorisation from Autoguide Equipment can adversely affect the performance of the machine and they may also create hazards.
- Before making a modification, consult Autoguide Equipment. Autoguide Equipment will not be responsible for any injury or damage caused by any unauthorised modification.

The safe operation of this rig is the responsibility of the operator, who should be familiar with the principles of pile installation, the power unit and all safety practices before starting operations.

Pre-operation check list

1. Keep bystanders away from the machine.
2. Ensure you are aware of the environment you are working in; including overhead cable, underground installations etc.
3. Observe all safety instructions and warnings.

Isolator

WARNING: Check to ensure nobody is working on the machine before switching the isolator on.

The isolator is mounted in the engine compartment of the excavator, directly behind the cab. It can be accessed with the mast in both work and transport positions by raising the bonnet.

To switch the power to the machine, twist the handle through 90°. When pointing towards the rear of the machine it is switched off and when pointing upright it is switched on.

Figure 1 - Isolator

Start Up

The machine is switch on using the existing key start in the excavator. Before starting the machine:

- Check the ground under the machine to see if there is any trace of oil or water leakage.
- Always check that there are no people in the surrounding area.

To start the machine:

1. Turn the key to position “1”. The electronic systems will initialise.
2. Turn and hold the starting key in position “2” until the indicator light for preheating goes out.
3. Turn the key to position “3” until the engine runs. If the engine does not start within 20 seconds consult the excavator instruction manual.

NOTE: After the Engine has started, allow it to warm up at slightly increased idling speed until the coolant reaches its operating temperature of about 80°C. Do not let the machine warm up at standstill.

To switch off the machine:

1. Let the engine run at idling speed for five minutes without any load.
2. Turn the key to “0” and remove it.

Tracking

Precautions when Tracking

- Always check that there are no people in the surrounding area. Be particularly careful to check behind the machine.
- Walk round the machine to ensure that no legs are deployed or foreign objects attached to the machine that could affect it tracking.
- Avoid sudden operations except in emergencies
    - Do not suddenly start, suddenly stop or suddenly turn the machine or carry out any other operation suddenly. Such operations may cause the tracks to come off or the machine to tip over.
- Travel carefully on uneven ground or on curves
    - When travelling on uneven ground or in places where there are many curves, reduce the travel speed and travel carefully.
- Be careful of road shoulders.
- Avoid travelling over obstacles or earth embankments as far as possible. If the machine has to travel over an obstacle, do as follows:
    - Never travel over large boulders, breakable objects, pieces of concrete, or other sharp objects.
    - Reduce the travel speed and travel carefully.
    - Steer the machine so that the centre of the rubber track passes directly over the obstacle. Mount the obstacle slowly and when the machine goes over the top and starts to tip forward stop the machine. Then slowly start the machine again. Never change direction when doing this.
    - Earth embankments may collapse under the weight or vibration of the machine and cause the machine to slip, so drive the machine slowly and do not change speed or direction. Be particularly careful when travelling over freshly dug ditches. They may collapse.
- When travelling on hills or slopes, always follow the precautions below.
    - Do not travel at an angle on a hill or slope, or parallel to the slope. Such action could result in the machine tipping over or slipping.
    - When travelling up hills or slopes, always travel directly up the slope. Ensure the machine is in low speed mode.
    - Do not suddenly change speed on the slope. There is danger that the direction of the machine may suddenly change and the machine may slip.
    - When travelling down slopes, ensure the machine is in low speed mode.
- Ensure good visibility
    - When working in dark places or at night, turn on the headlamps and if not on the road, the working lights.

- Operate carefully on snow
    - When working on snow or icy roads, even a slight slope may cause the machine to slip to the side, so always travel at low speed and avoid sudden starting, stopping or turning.
    - Where there has been heavy snow, the road shoulder and objects placed beside the road are buried in the snow and cannot be seen, so always carry out the operations carefully.

Tracking Control

The tracking control is operated using the two tracking levers positioned centrally in the cab in front of the operator. They are standard excavator controls and can be operated using the foot pedals or by hands.

NOTE: The tracking controls have not been modified, so for standard rig operation working with the blade at the rear, when pushing the lever forwards the rig will track in reverse or in the direction of the blade

Guard

The guard is fixed onto the mast so that it is a fixed distance from the floor at all times. It is designed in accordance with *Federation of Piling Guidance on PUWER (Regulations 11&12)*.

For unrestricted access when piling the guard should be in use at all times. The door should be locked together using both catches.

Figure 2 - Guard Shut During normal Working

If the guard is opened then the gearbox will automatically change into low speed mode. This is to protect any workers that may be in the vicinity.

The guards can be removed if required for maintenance. To do this first disconnect the Emergency Stop and Guard switch using the connectors by the auger cleaner, then remove the M16 bolt and retaining plate from the bottom of each guard shaft and lift out.

Controls

The controls for the piling mast are all located on the excavator joysticks in the cab. They have been split into 2 different modes for operation:

Mode 1: Set Up

Mode 2: Drilling

To switch between modes there is a switch located on the left hand control arm. When raised Mode 1 is selected, when depressed Mode 2 is selected.

The controls are:

Function	Control Levers			
	Mode 1		Mode 2	
	Left	Right	Left	Right
Rotating the upper carriage to the left	⇦	-	⇦	-
Rotating the upper carriage to the right	⇨	-	⇨	-
Raising the mast	⇧	-	⇧	-
Lowering the mast	⇩	-	⇩	-
Rotating the mast clockwise	-	⇦	-	-
Rotating the mast anticlockwise	-	⇨	-	-
Tilting the mast forwards	-	⇧	-	-
Tilting the mast backwards	-	⇩	-	-
Rotating the gearbox anticlockwise	-	-	-	⇦
Rotating the gearbox clockwise	-	-	-	⇨
Raising the carriage	-	-	-	⇧
Lowering the Carriage	-	-	-	⇩

Raising the Mast

Raising the mast requires the dump ramp to be used when standing the mast up otherwise the foot of the mast will impact with the floor and raise the front of the machine off the floor. The control arm must also be moved into the operational position.

To raise the mast:

1. Ensure the machine is on a level surface and the area in front of the machine is clear.

2. Tilt the mast forwards.
3. As the mast foot gets close to the ground, raise the dump mast ram.
4. Tilt the mast until upright. The inclinometer built into the NDT system shows the current inclination of the mast and can be used to level the mast.
5. Rotate the mast so that it is upright similar to above.
6. Lower the dump mast ram until the mast sits on the ground.

Figure 3 - Standing the Mast Upright

Storing the Mast

Storing the mast is the opposite of standing the mast up, but the mast must be rotated parallel to the chassis to avoid hitting the cab while lowering the mast. It is important to also ensure that the gearbox is not in a position along the mast where it will hit the cab.

1. Raise the mast approximately 200mm off the floor using the dump ram.
2. Rotate the mast so that it's parallel to the chassis.
3. Slowly operate the tilt ram to lower the mast. As it folds away monitor the gearbox position so that it will not hit the cab, and lower the dump ram until fully retracted.

4. Lower the mast until the close to the cradle. Then rotate the mast to ensure it will sit in centrally in the cradle. To aid two red arrows on the slew ring show the optimum position for the mast when aligned.

Figure 4 - Cradle Alignment Arrows

5. Completely lower the mast until resting in the cradle.

Piling Controls

The controls that are required frequently when piling are on Mode 2. This should be what the operator needs to use while drilling.

Carriage

To control the height of the carriage use the right hand joystick. The carriage has 2 speed settings that allow quick retraction or a slower mode that gives the operator increased control required for when concrete pumping is taking place.

When moving the carriage down, low speed mode is permanently selected.

When moving the carriage up, the high speed mode is automatically selected. To change into low speed mode, there is a button located on the left hand control arm indicated with a slow symbol.

The height of the carriage can be seen on the NDT screen along with the current depth of the pile drilled.

The carriage and auger cleaner (see page 24) have been connected together so that if the carriage is near the bottom of the mast then the cleaner cannot be inserted, and similarly if the cleaner is inserted, the carriage cannot be lowered below a set point.

Freefall

The carriage can be set to freefall when piling so that it lowers as the auger pulls it into the ground. To activate the freefall depress the right hand side on the right foot pedal. It is only active when the pedal is fully depressed.

Controlling the Gearbox

The gearbox can be controlled using the right hand joystick.

To turn the gearbox clockwise, screwing into augers into the ground operate the joystick to the right. To turn the gearbox anticlockwise, unscrewing the augers from the ground operate the joystick to the left.

The gearbox will automatically adjust its speed dependant on the torque required to drill the hole. For higher torque requirements (i.e. Drilling) it will spin slowly, and for lower torque requirements (i.e. Spin off) it will spin faster. To manually override the speed there is a dial on the left hand control arm that can be twisted to change the motor speed. Due to the nature of the control system the lag time between turning the dial and the motor speed changing may be up to a few seconds. This system will only decrease the speed/increase the torque if the torque required is less than what the motor is automatically adjusting too.

Low Speed Mode

The gearbox will automatically enter a low speed mode if the guard is opened during use, or the head spun without the guard fully shut. This is in line with *Federation of Piling Guidance on PUWER (Regulations 11&12)*

Figure 5 – Control Arm Display Panel

Torque

The torque being produced by the gearbox is displayed on the NDT screen.

RPM

The gearbox rotational speed is displayed on the NDT screen.

Kelly Bar

The rig is fitted with a Kelly Bar extension that allows an extra 4m of depth to be drilled on top of the maximum of 8m of augers fitted to the rig. The Kelly bar has 2 drive positions: 1 at the top; and 1 at the bottom. It is important that the bar is only driven on these points as the intermediate guides are not designed to be driven on.

The drive points on the bar are inset to allow for lifting of the Kelly bar and auger string when required.

Note: When lifting on the Kelly bar, it must not be spun in the opposite direction to which drive teeth are engaged on. This will cause the Kelly bar to drop!

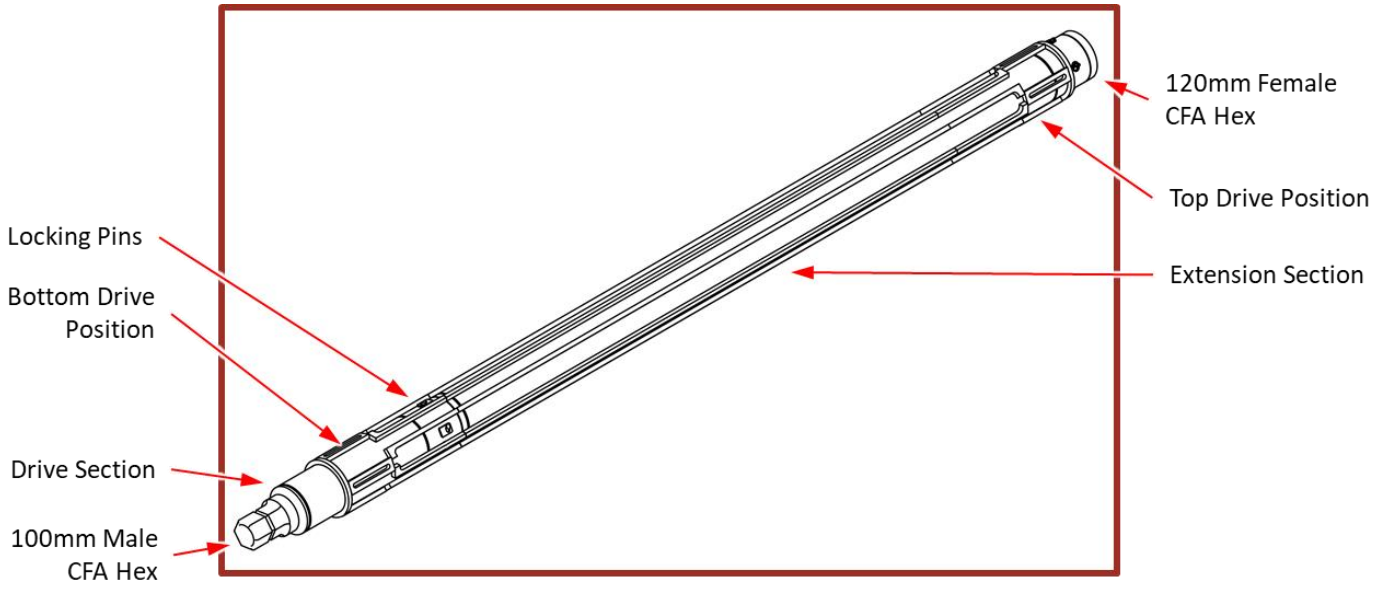


Figure 6 - Kelly Bar Assembly

Auxiliary Controls

Blade

If required, the blade controls as a factory fitted to the excavator and are located on a small separate joystick on the right hand side of the cab.

Winch

The winch is controlled using the thumb switch on the right hand joystick. Push to the right to raise the line and left to lower. Similar to the joysticks, the further it is moved to one side the faster it will rotate.

The winch has a sensor at the top of the mast to stop the cable being wound in too far. If the winch will not retract, check to see if this has been activated. To determine if this has been activated, check the angel of the fairlead. If it is pointing towards the ground then it is deactivated. If it is horizontal or pointing up then it has been activated.

Figure 7 – Winch Fairlead

Note: The winch is attached to the auxiliary circuit on the digger. If the winch is only acting in 1 direction then check that the Auxiliary 2 circuit settings on the digger isn't set to "Breaker Mode". Consult the excavator manual for more information.

Auger Cleaner

The auger cleaner is controlled using the thumb switch on the left hand joystick. Push to the left to insert the cleaner and right to remove. Similar to the joysticks, the further it is moved to one side the faster it will move.

The cleaner has been set so that when fully inserted it will not contact the central tube of the auger.

To determine if the cleaner is fully retracted, a marker is visible on the bottom of the mast that is visible from the operators seat. The cleaner is fully retracted when the end of the rod is aligned with the marker.

Figure 8 - Auger Cleaner Stowed Marker

The cleaner and carriage have been connected together so that if the carriage is near the bottom of the mast then the cleaner cannot be inserted, and similarly if the cleaner is inserted, the carriage cannot be lowered below a set point.

Guide Ring

The mast is fitted with a guide ring for 500mm augers at the base. If smaller augers are to be used an adapter can be fitted that clamps between the 2 guide ring halves. To fit the adapter:

1. Open the guide ring as wide as possible.
2. Lift the guide ring adaptor so that it sits on the back of the 2 guide ring halves.
3. Support the guide ring adaptor at the front using the handle while closing the 2 halves.

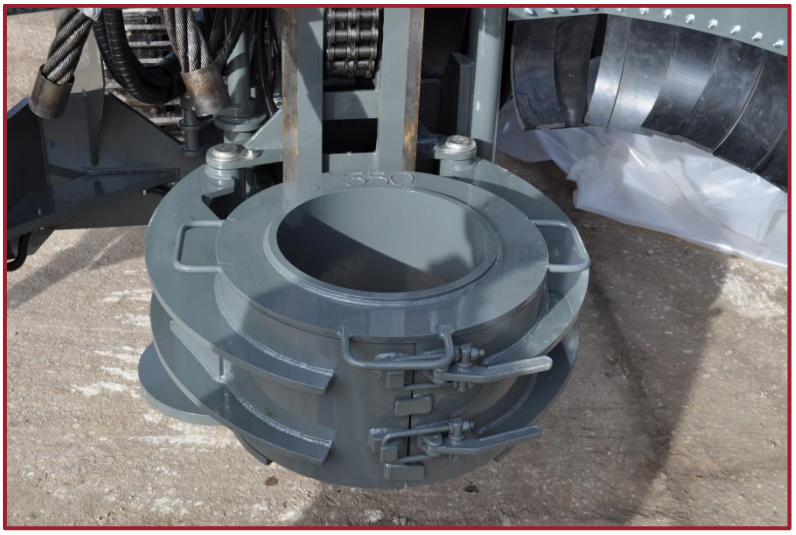


Figure 9 – Guide Ring with 350 Auger Adaptor fitted

Operating Safety

For safe use, ensure all these points are followed:

- Always operate the machine when on level and stable ground.
- All outriggers should be deployed to ensure machine stability.
- Ensure all operators are wearing the required PPE.
- All operators should be familiarly with the machine controls and operating procedure.
- All workforce should be clear of the machine when in operation.
- Do not block the radiator grills or exhaust pipe.
- Do not put any hands or foreign objects in the way of the wire or weight.
- Keep feet and hands clear when operating the machine.

TRANSPORTATION

The rig can be transported in 2 configurations.

- With the Kelly bar and a maximum of 2m of auger attached. The gearbox must be in front of the cab when the mast is in the transport position, and Kelly bar appropriately supported (see below).
- Without the Kelly bar but between 6-8m of augers attached. The gearbox must be behind the cab and the augers must be protruding through the guide ring to provide a reaction force when lowered.

Mast

To tie down the mast for transport, the Kelly bar has to be supported. This requires the use of the jack provided. To tie the mast down:

1. Lay the mast down in its transport position with the gearbox forward of the cab.
2. Open latches at the back of the jack
3. Place onto mast rail so that the back (with the latch on) is facing towards the gearbox
4. Close the latch, ensuring both legs have closed fully and are underneath the mast slide rails. Insert the locking pin

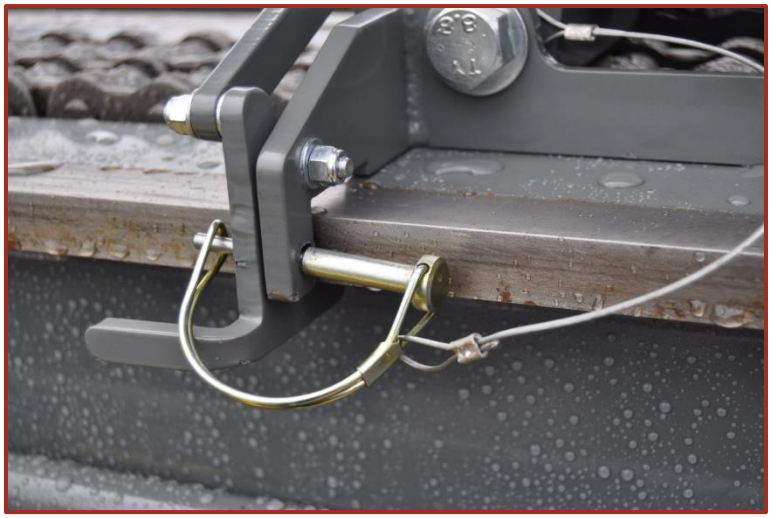


Figure 10 - Kelly bar jack locked onto the mast

5. Close the release valve and pump the jack. It may be necessary to angle the cradle before it touches the Kelly bar.

Figure 11 - Kelly bar jack being raised

6. Jack until the retaining holes for the retaining bolt are in alignment, and insert.

Figure 12 - Kelly bar jack retaining bolt holes and bolt

7. Tie down with 2.5T ratchet strap, ensuring it goes under the swan neck guide box section, under the valves and pipework for the winch and over the Kelly bar. There are welded hooks on the base of the cradle each side to attach onto.

Figure 13 - Kelly bar ratcheted for transport

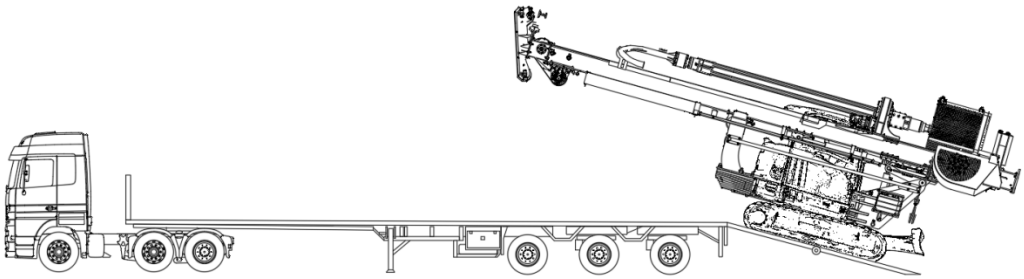
To remove the jack:

1. Remove ratchet strap
2. Remove locking bolt.
3. Open the release valve slowly.
4. Once Kelly bar has fully lowered, manually push down the arm all the way.
5. Now remove locking pin, open the latch and remove the jack from the mast.

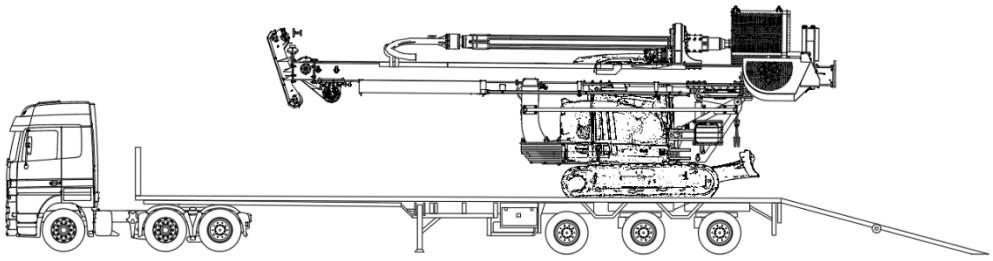
Loading

The rig must be loaded on a low loader by reversing up access ramps onto the trailer bed. The blade must be at the front of the machine, and the weight should be at the rear. Once on it is advisable to turn round for transport. The process for loading is:

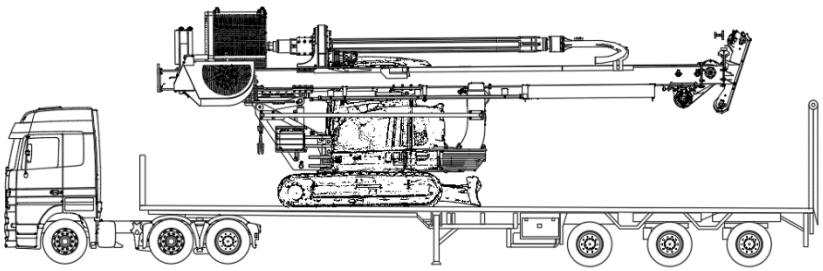
1. Reverse the machine onto the bed, weight first with the blade facing down the ramps.



2. Track until the centre of the digger is above the centre of the tyres.



3. Slew the machine 180° so that the weight is over the blade.
4. Track forward until in position and lower the blade.



5. Tie down using the excavator tie down points.

Excavator Tie Down Points

There are 4 tie down points located on each side of the excavator undercarriage. They are:

- Dozer Blade
- Front of travel gear
- Rear of travel gear
- Inside of travel gear.

A minimum of 2 of these points on each side of the excavator must be used to secure the machine while in transport.

More information can be found inside the excavator manual.

Unloading

Unloading is the reverse process.

SERVICE INFORMATION

Service Schedule

The service schedule of machine items is as follows:

	Service Item	First 50 hour service	Service Interval			
			10 Hours *Daily*	50 Hours *Weekly*	500 Hours *6 Months*	1000 Hours *Annually*
Hydraulics	Hydraulic Oil		Check			Change
	Hydraulic Oil Return Filter	Change			Change	
Other	Lubricating Points			Grease		
	Mast Chain					
	Chain Drive					
	Wear Pads			Check		
	Wear Pad Tensioning Bolts			Check		

Daily Service Items

Hydraulic Oil

The machine is powered by Hydraulic Oil. Clean oil and filters are essential for reliability and performance.

The machine runs on **HLP 46 Grade Hydraulic Mineral Oil**. Make sure you use the correct grade for the ambient conditions and only top up with the same make and grade.

Hydraulic oil level and temperature is displayed on the sight gauge on the nearside of the oil tank under the bonnet. This should be monitored throughout the working period of the machine to ensure the oil does not overheat or run out.

To check the hydraulic oil level, ensure mast is stood upright and then read the level on the sight gauge. The oil level should be in line with the sticker provided. If the oil level is below the minimum, it requires refilling.

WARNING: Do not fill the tank above the line provided! This allows for additional oil as the mast is stowed into the transport position to be stored in the tank.

Figure 14 - Oil Tank Gauge

To refill the hydraulic oil:

1. Ensure that the machine is switched off and isolate the supply.
2. Unscrew the tank filler breather port slowly to release the pressure inside the tank.
3. Fill with HLP 46 Grade Hydraulic Mineral Oil.
4. Replace the filler lid.

Wear Pads

The wear pads are designed to not need to be greased. They are dry running.

Over time the wear pads will degrade and wear. As this happens the spacers between the wear pads will need to be removed to ensure the pads are kept in contact with the metal slides. Each set of wear pads comes with 10mm of spacers (consisting of 4 x 2mm and 2 x 1 mm) to enable all thicknesses between 0 – 10mm to be achieved.

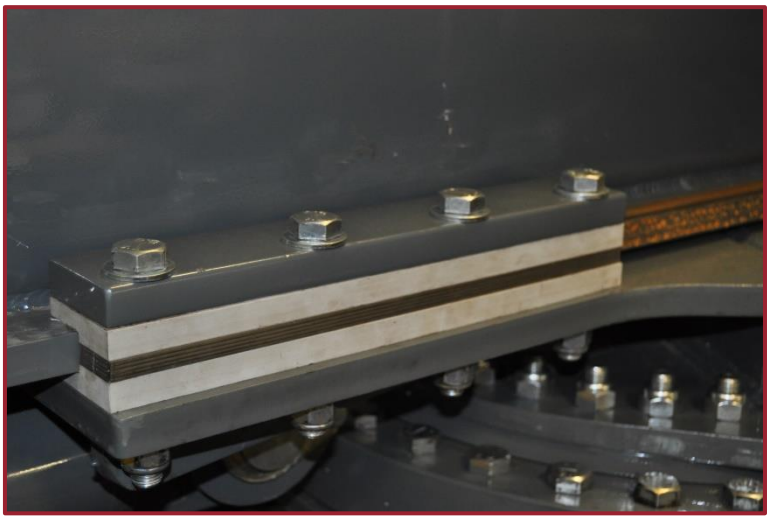


Figure 15 - Wear Pad Assembly and Spacers

To adjust:

1. Ensure all other wear pads are tight and in place.
2. Loosen the bolts of one assembly.
3. Slide out and remove 1mm of spacers (or remove 2mm and add a 1mm). You do not need to completely remove the bolts.
4. Retighten the bolts to **25Nm**.

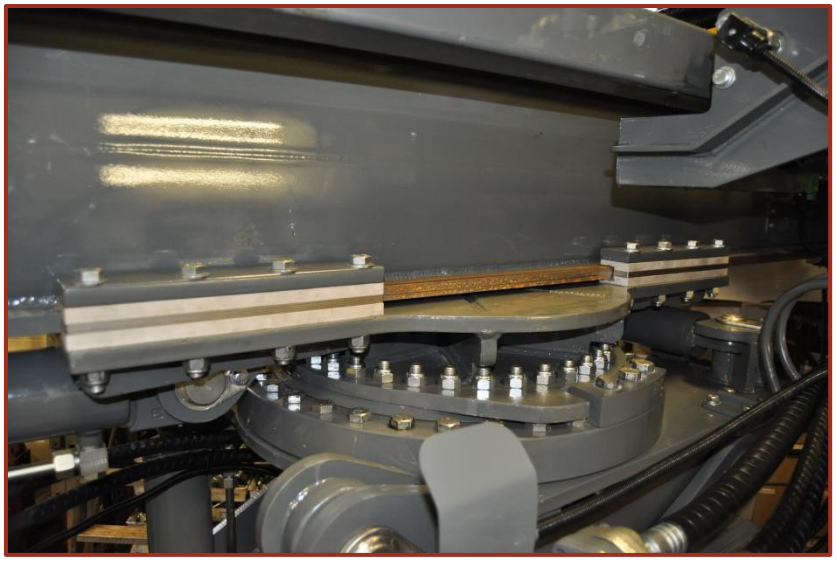


Figure 16 - Mast Wear Pads and Locking Bolts

If the wear pads are worn completely and need to be replaced the process is similar to adjusting the pads, apart from that the bolts need to be removed completely to enable the removal of the wear pads.

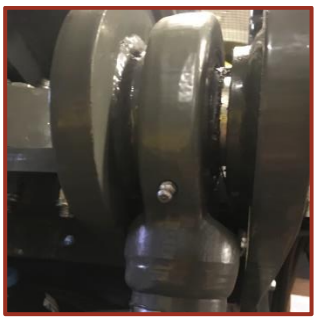
WARNING: Be careful not the trap fingers between heavy parts when removing the wear pads.

Lubrication

There are multiple grease points located on the machine. It is important that these grease points are all lubricated frequently, either after every 250 hours of service or monthly, whichever is first.

List of Grease Points:

- Tilt Rams spherical ends




- Rotate Ram spherical ends

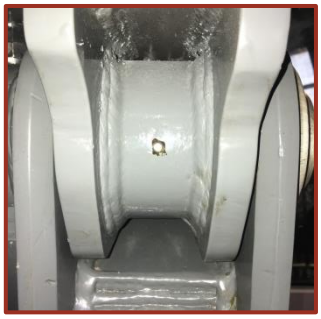

- 2 x Slew Ring Grease Points

- Dump Ram spherical ends


- Mast Chain tensioner pin

- Mast Chain Tensioner bearings


- Main Pivot bushes

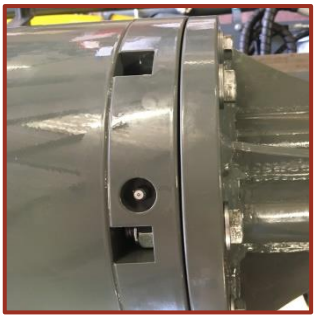
- Guard Door bushes

- Guide Tube bushes

- Auger Cleaner Ram butt, head and mechanism


- Top mast bearings – 1 grease point each side of the mast

- Concrete Swivel



Chain Tensioner

The mast chain is kept under tension at the base of the mast when the carriage is being pulled down the mast by the chain. The tension is applied using a hydraulic ram under pressure, but it can be depressurized to service the chain.

The ram controls are located within the support frame on the front of the digger.

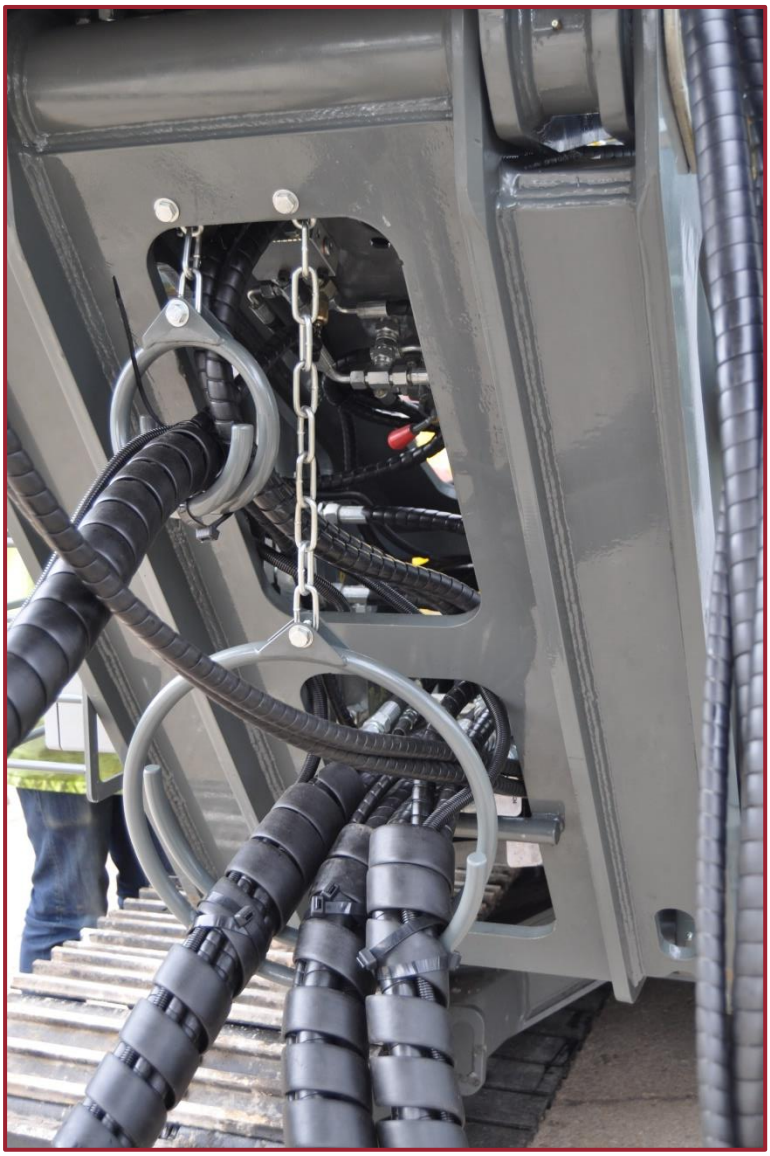


Figure 17 - Chain tensioner control location

To depressurize the chain:

1. Locate the control handle within the support frame

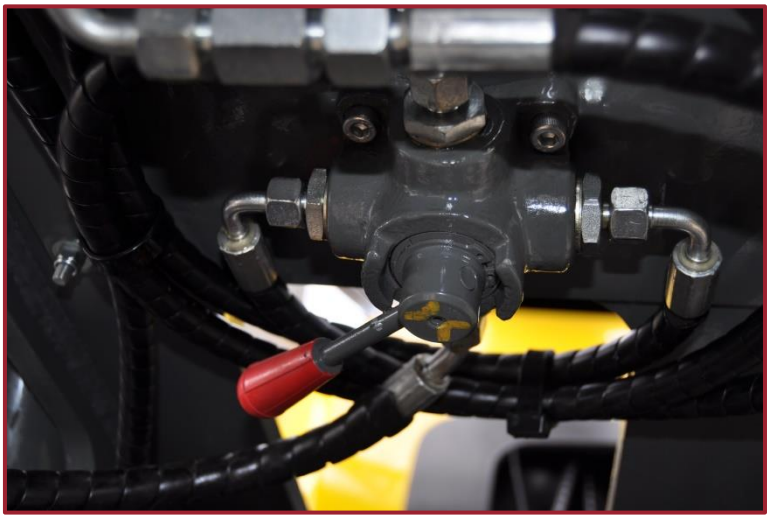


Figure 18 - Chain Tensioner handle

2. Turn the handle 90° anticlockwise. This will depressurize the ram. The chain will go slack.
3. If required, there is an access hole in the rear of the mast
4. To pressurise, turn the handle 90° clockwise and start the machine. Raise the carriage to pressurise the ram.

Mast Chain Drive

The carriage is driven by single stage chain drive. This will require tensioning as the chain stretches. The chain is protected by a guard at the top of the mast, and this can be removed to access the chain.

Figure 19 – Chain Drive Guard

To tension the chain:

1. Ensure the mast is in the cradle and on level ground.
2. Remove the guard by taking out the 4 x M8 bolts
3. Loosen the 4 x M20 bolts that attach the chain drive from the mast so that the drive can slide along the mast.
4. Release the lock nut on the set bolt that holds the chain drive in position.

Figure 20 – Chain Drive Adjustment Set Bolt

5. Switch the machine on and activate the freefall function. This will require a second person.
6. With the freefall active, rotate the set bolt clockwise to move the chain drive along the mast and tighten the chain.
7. Once tight, retighten the locknut and then release the freefall function.
8. Retighten the 4 bolts that that attach the chain drive to the mast to 400Nm.

Carriage Freefall

The rate at which the carriage drops when the freefall feature is activated can be adjusted. This is controlled via a screw valve at the top of the mast. To adjust:

1. Lay the mast in the cradle so the top of the mast can be accessed via a platform or ladder
2. Locate the screw valve on the top of the mast that faces the cab.

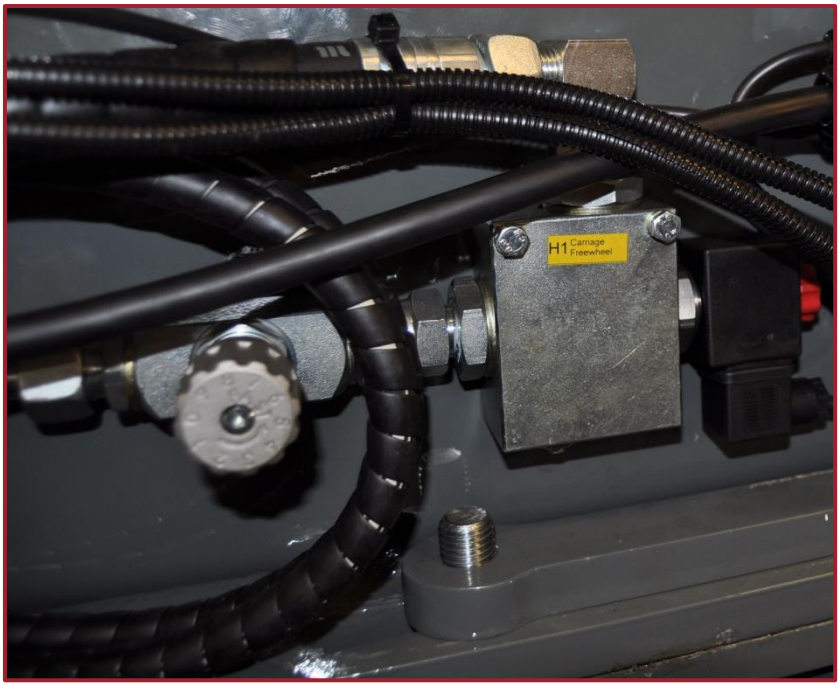


Figure 21 - Freefall Screw Valve

3. Loosen the locking torx screw in the centre of the knob.
4. Adjust the knob to suit. The greater number increases the rate at which the carriage will freefall.
5. Retighten the locking torx screw.

TROUBLESHOOTING

Symptom	Possible Cause	Action
Gearbox Slow	Slow Speed Selected	Select the appropriate setting
	Guard Open	Shut the guard and lock both doors.
	Loose electrical connection	Check the inline guard electrical connectors
	Low Speed Lock Solenoid not active	Check that the solid valve on the centre of the gearbox back plate has a red LED indicator showing it's active when the guard is shut.
	Machine auxiliary flow has been reduced	Consult the excavator instruction manual to change the auxiliary 1 flow to maximum
Mast Loose Chain	Chain tensioner not tight	Ensure that the chain tensioner handle is in the active position. See section in
Mast Chain Drive Loose	Mast chain drive needs tensioning	See section in Maintenance
Winch only working in 1 direction	Machine auxiliary flow is in Breaker mode	Consult the excavator instruction manual to change the auxiliary 2 flow to double acting
Carriage stiff	Slide bolts too tight	Loosen bolts individually and retighten – see section in Maintenance
Mast Dump Stiff	Slide bolts too tight	Loosen bolts individually and retighten – see section in Maintenance
Carriage loose on mast	Wear pads worn	Remove wear pad spacers in 1mm thicknesses until pads are in contact with the mast.
Mast loose on pivot plate	Wear pads worn	Remove wear pad spacers in 1mm thicknesses until pads are in contact with the mast.
Oil leaks	Loose Fittings	Tighten Up Fittings
Jerky	Cold Oil	Allow time to warm up
	Air in Pipes	Check oil Level

END OF LIFE

When the machine reaches the end of its useable lifetime it is important that the independent elements of the machine are reused, recycled or disposed of suitably.

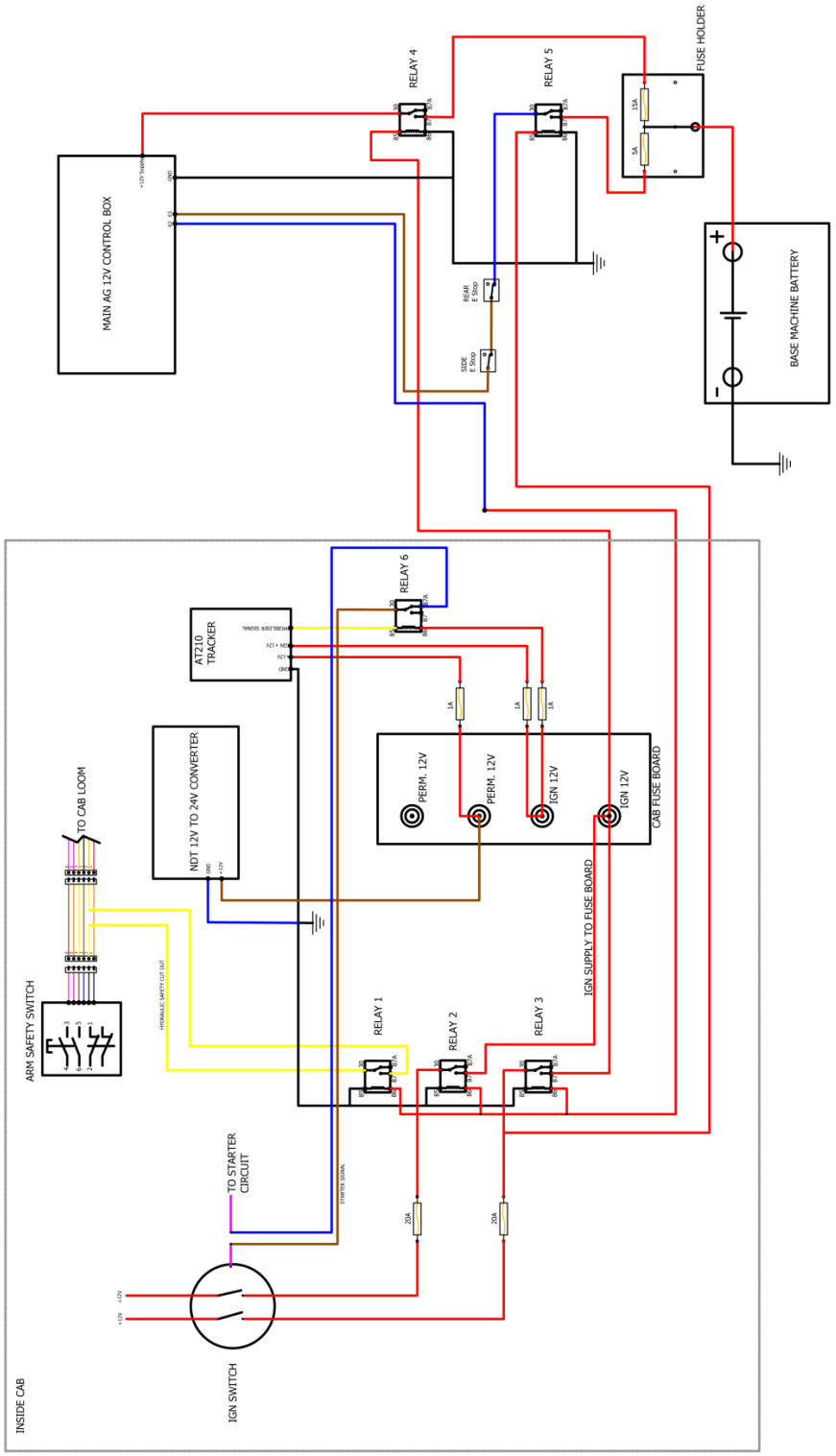
Component	What to do?
Metals	All metals should be recycled with an appropriate scrap metal merchant, preferable sorted into metal type.
Electronics	All electronical components should be recycled at an appropriate facility according to the WEEE Directive and Regulations 2013
Oils	Oil waste is classed as Hazardous and therefore must be stored separately and according to legal regulations (that differ dependent on country). It must be disposed of be a suitable Waste Oil collection company.
Hydraulic Hoses	Hydraulic hoses should be drained of oil, metal ends removed and then recycled with a suitable specialist recycling company. Metal ends can be sent to metal recycling centers.
Plastics	All plastics should be sorted into recyclable and no recyclable and then either sent to suitable recycling facilities or landfill.

ELECTRONIC SYSTEM

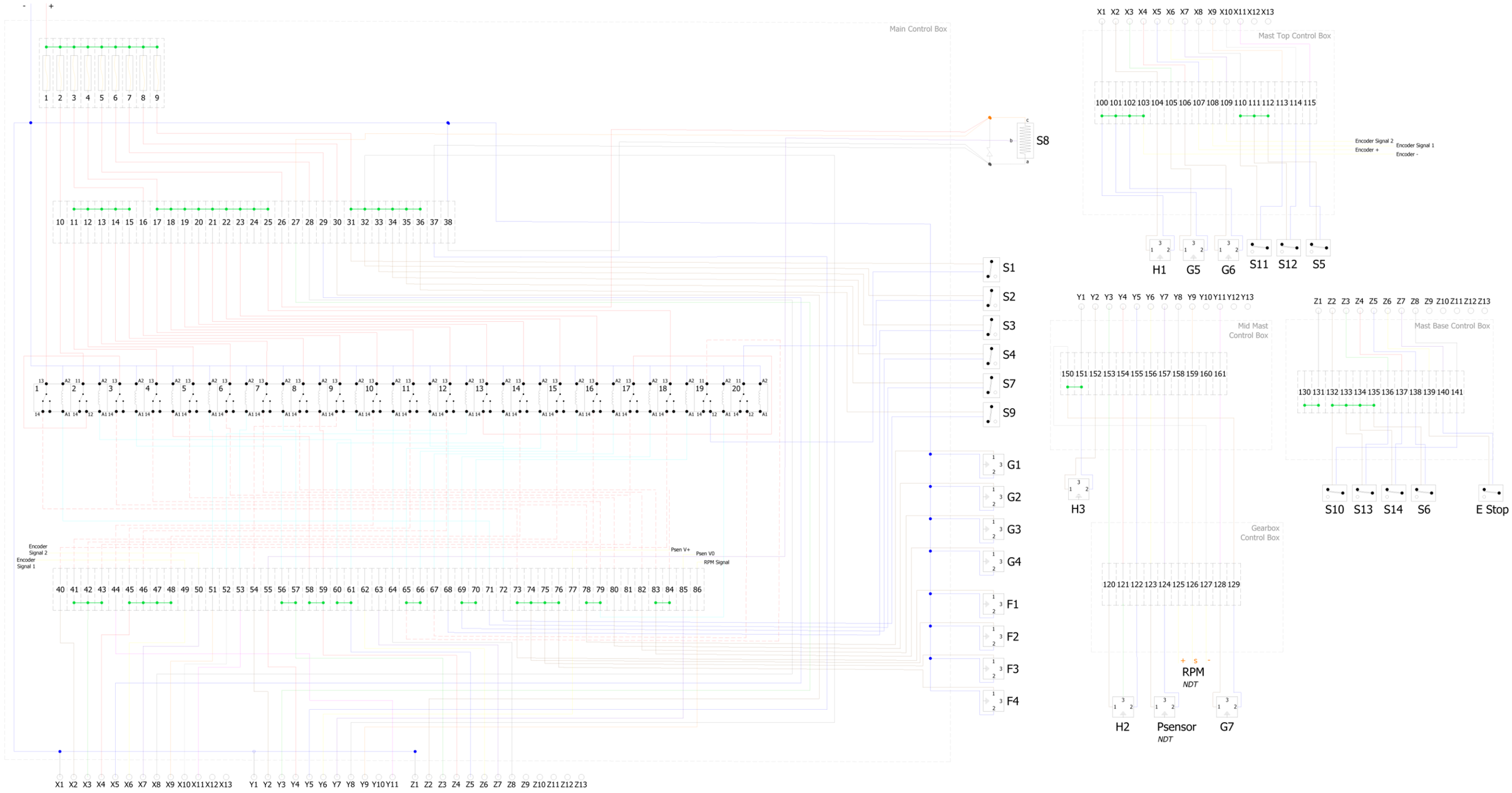
List of Sensors and Valves

Name	Purpose	Location
S 1	Pressure Switch Carriage Down	Under the cab
S 2	Pressure Switch Carriage Up	Under the cab
S 3	Winch Active	Hydraulic Compartment
S 4	Carriage Freefall (Foot Pedal)	Under the cab
S 5	Winch Limit	Cathead Pulley System
S 6	Cleaner Stowed	Mast Base
S 7	Mode 1/2	In Cab – Left Control Arm
S 8	Potentiometer	In Cab – Left Control Arm
S 9	Low Speed Lock	In Cab – Left Control Arm
S 10	Guard Open	Left Guard Top
S 11	Carriage Upper Limit	Mast Top
S 12	Carriage Upper Low Speed	Mast Top
S 13	Carriage Lower Position	Mast Base
S 14	Carriage Lower Limit	Mast Base
F 1	Right Joystick Backwards	Under the cab
F 2	Right Joystick Forwards	Under the cab
F 3	Right Joystick Left	Under the cab
F 4	Right Joystick Right	Under the cab
H 1	Carriage Freewheel	Mast Top
H 2	Motor Displacement	Gearbox
H 3	Winch Overrun	Winch Mount Plate
G 1	Carriage Down Stop	Under the cab
G 2	Carriage Up Stop	Under the cab
G 3	Winch Up Stop	Hydraulic Compartment
G 4	Auger Cleaner Stop	Hydraulic Compartment
G 5	Carriage Brake	Mast Top
G 6	Carriage Low Speed Lock	Mast Top
G 7	Gearbox Low Speed Override	Gearbox

In Cab Electronics

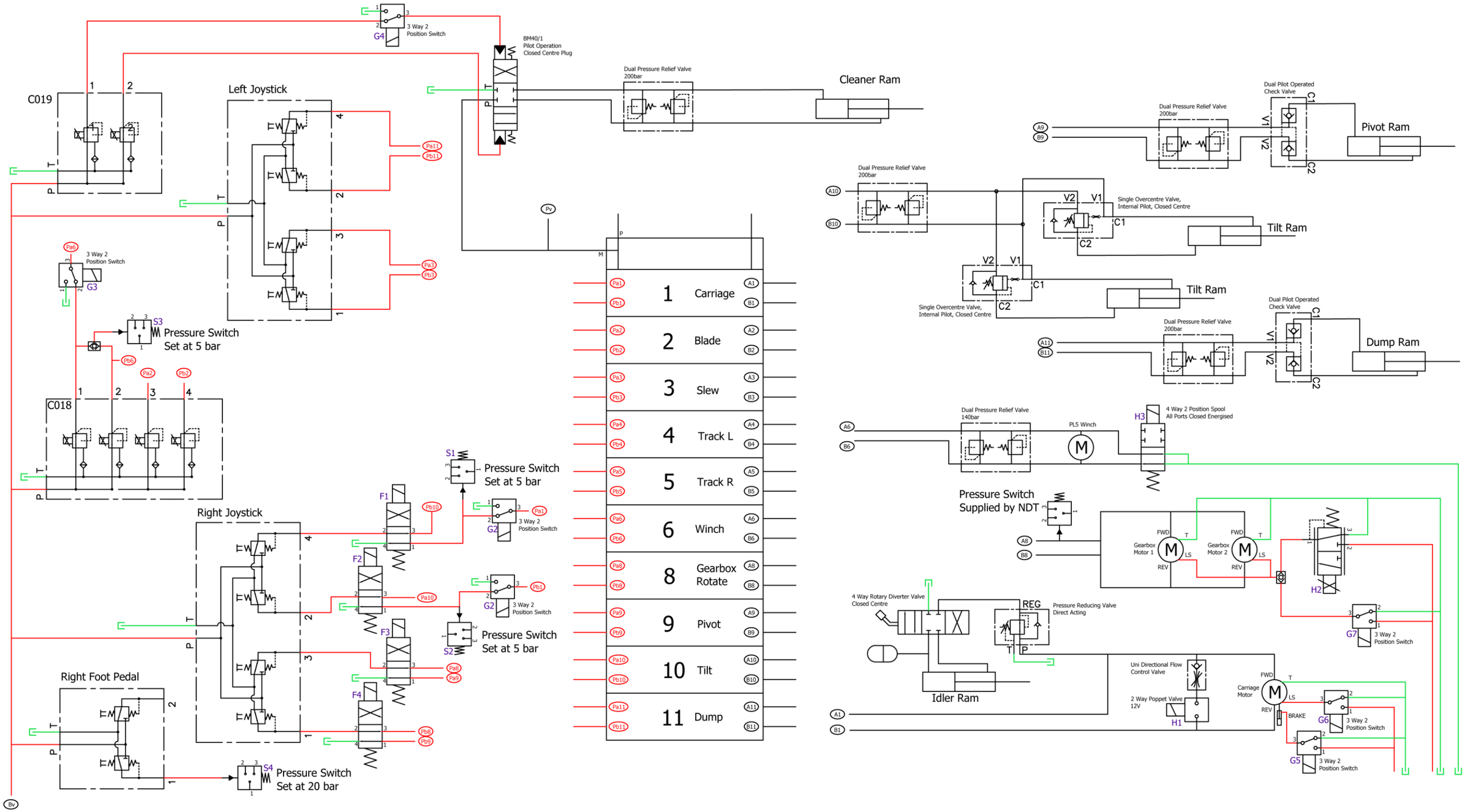


12V Electronic System



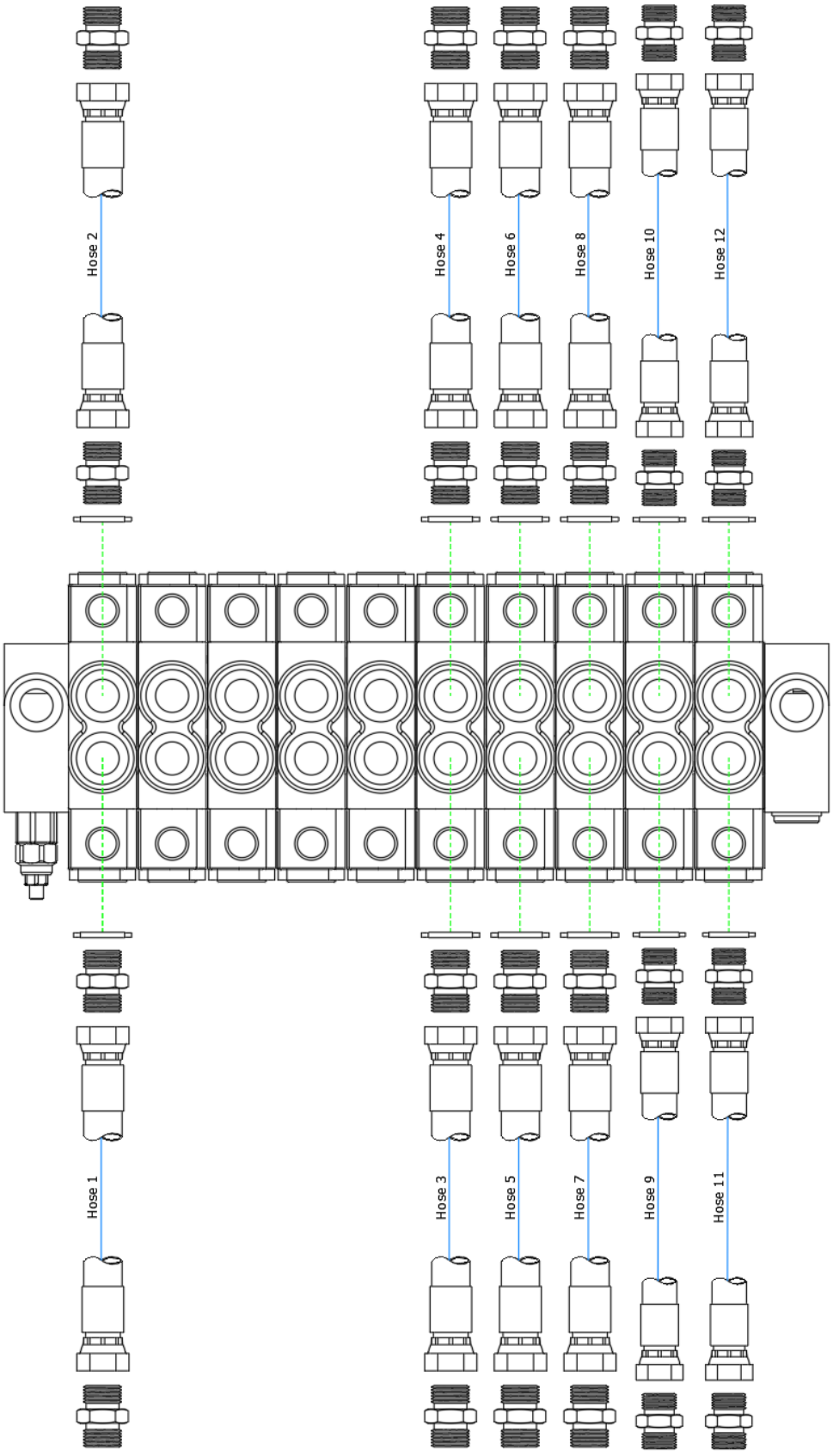
HYDRAULIC DIAGRAMS

Hydraulic System Schematic

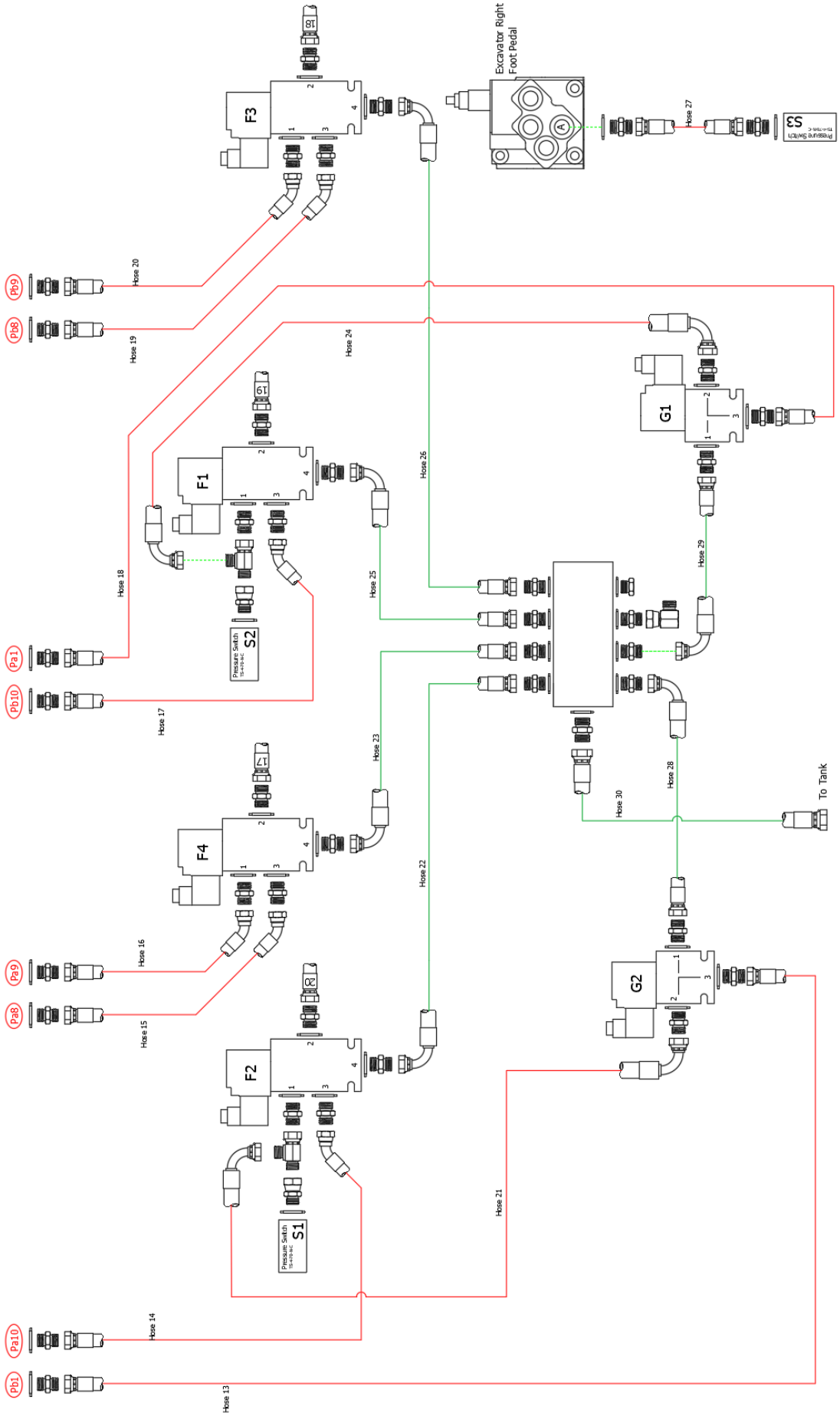


Hydraulics Hoses

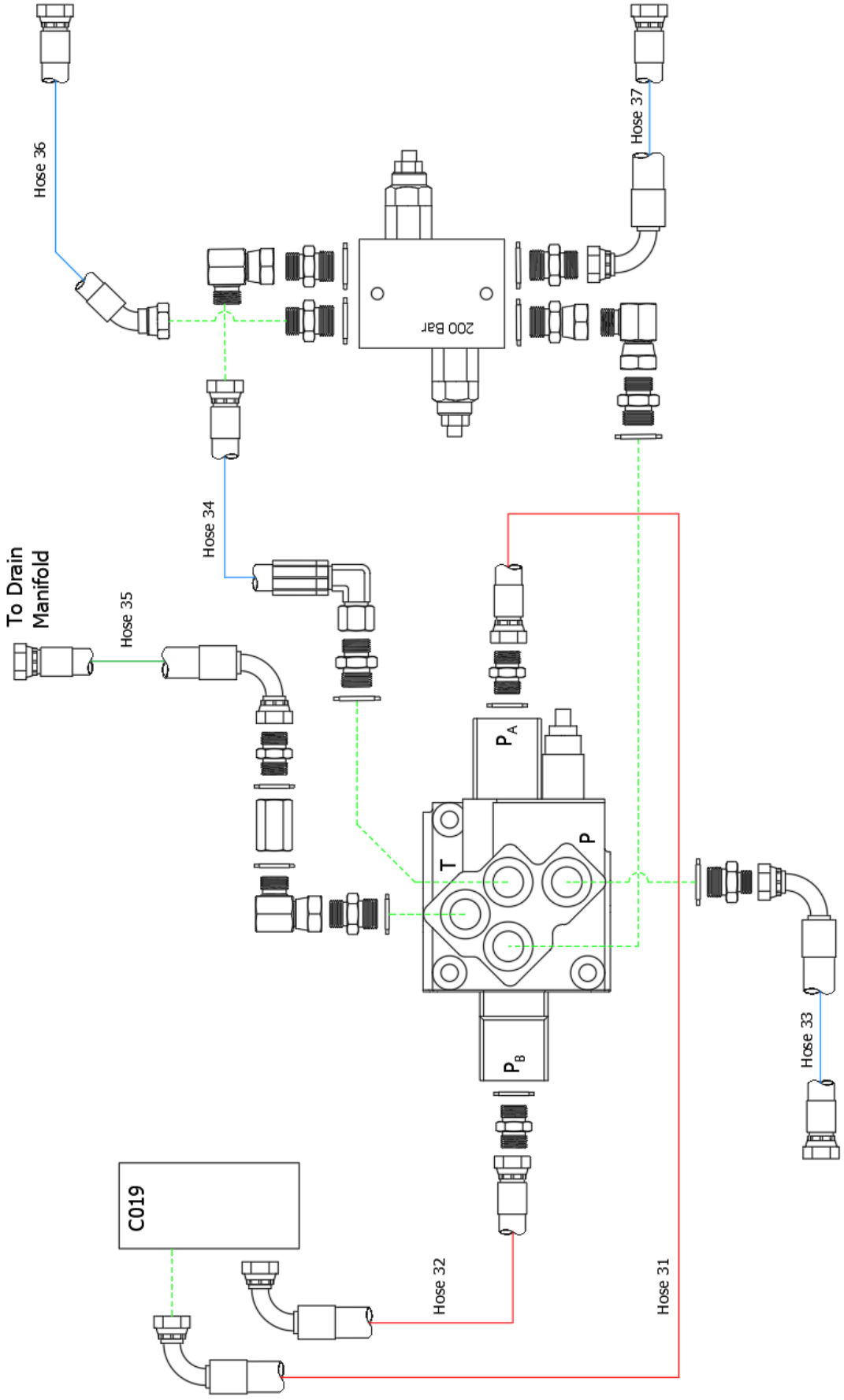
Spool Block



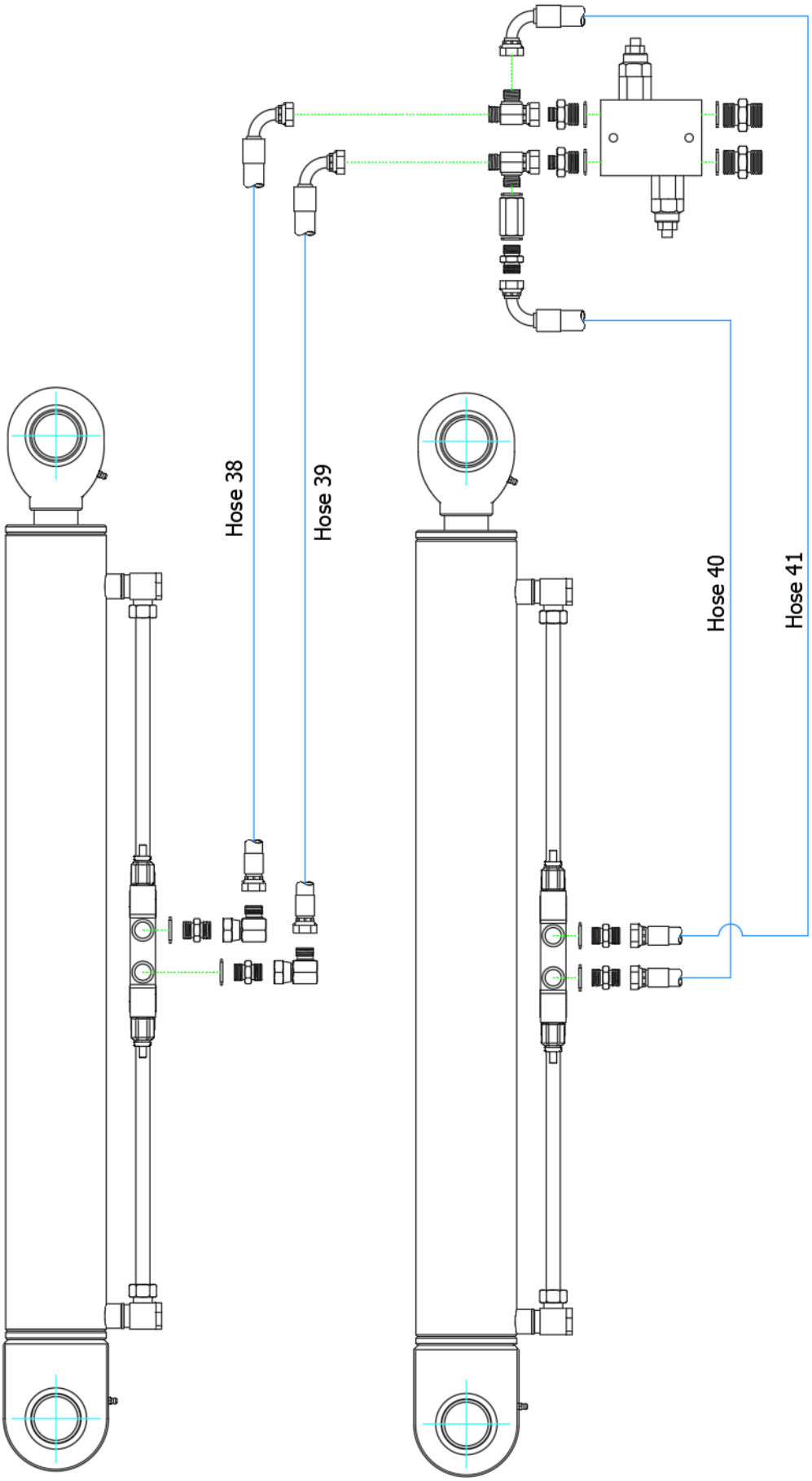
Flow Control Valves



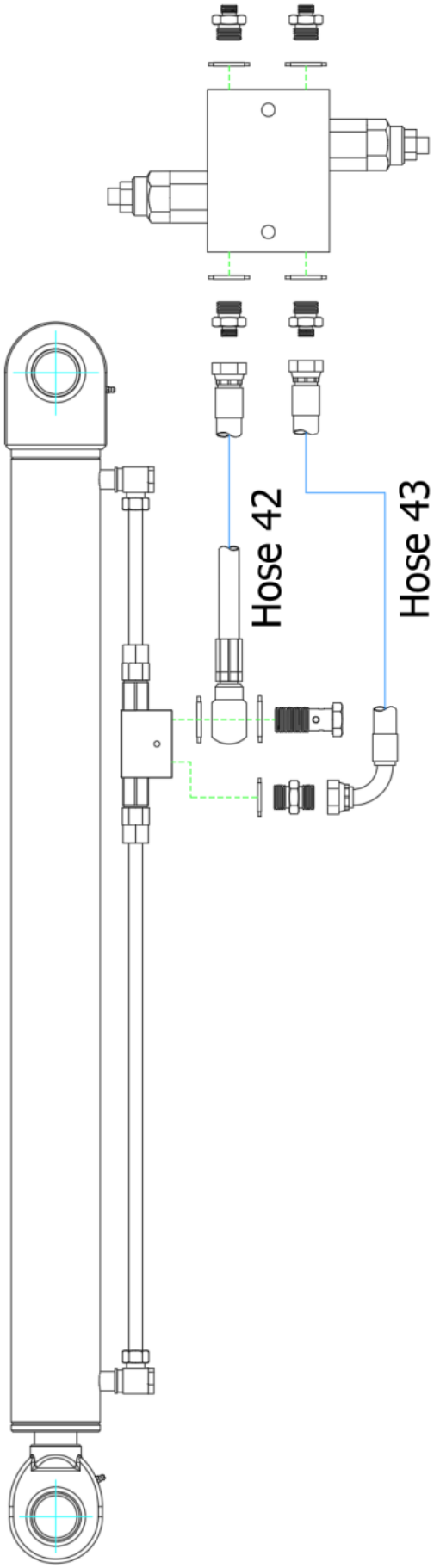
Auger Cleaner Controls



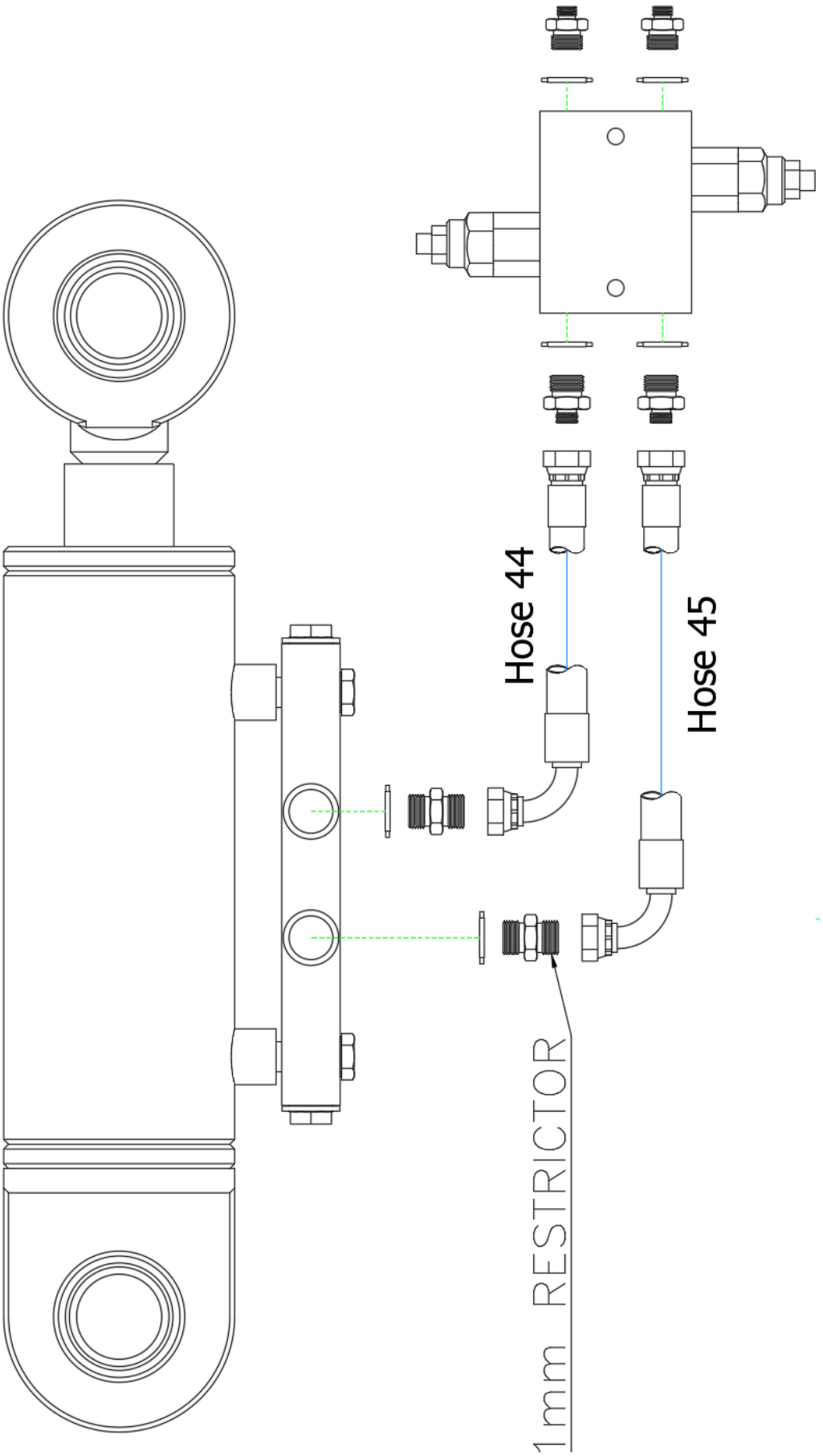
Tilt Rams



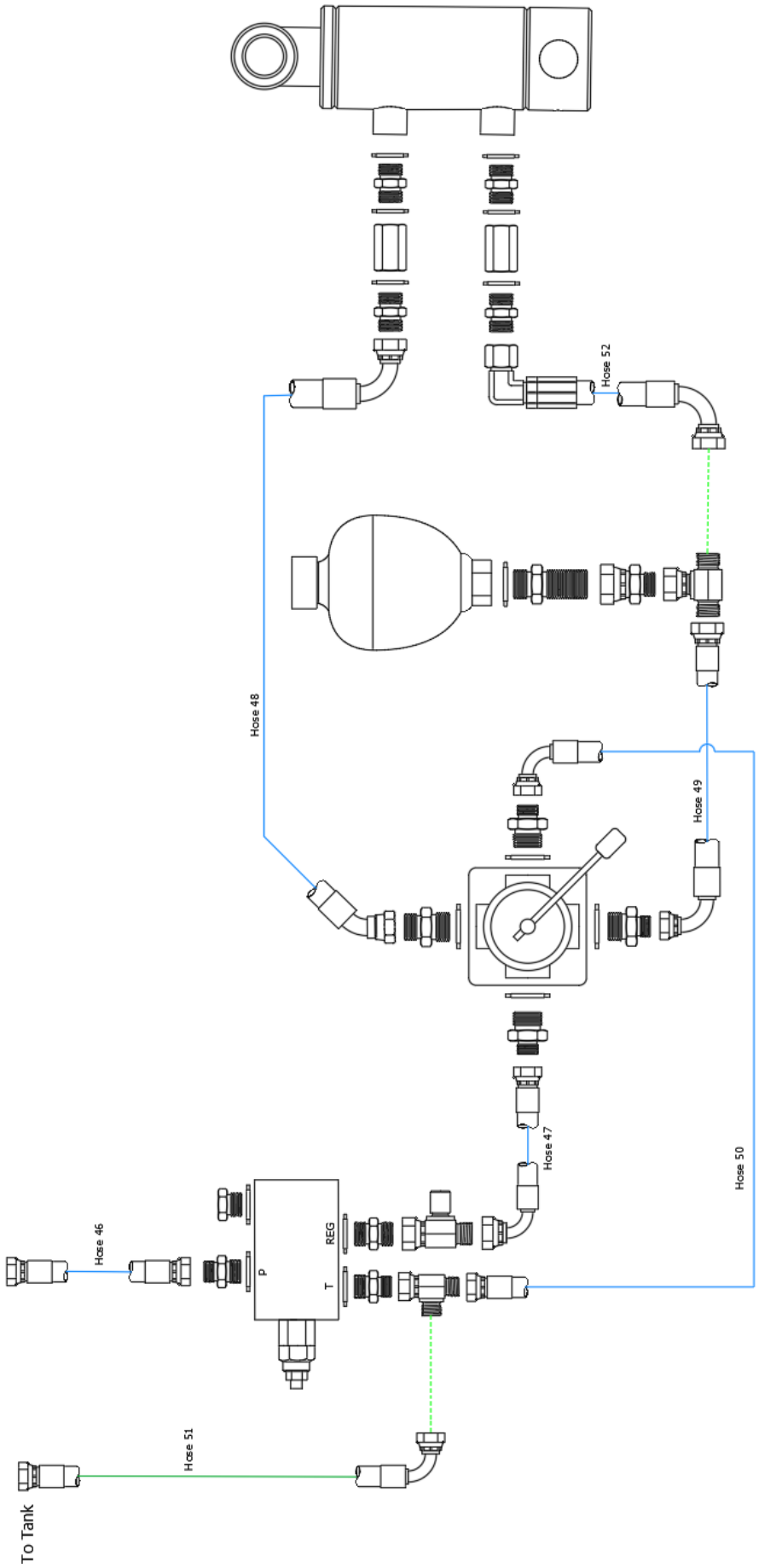
Dump Ram



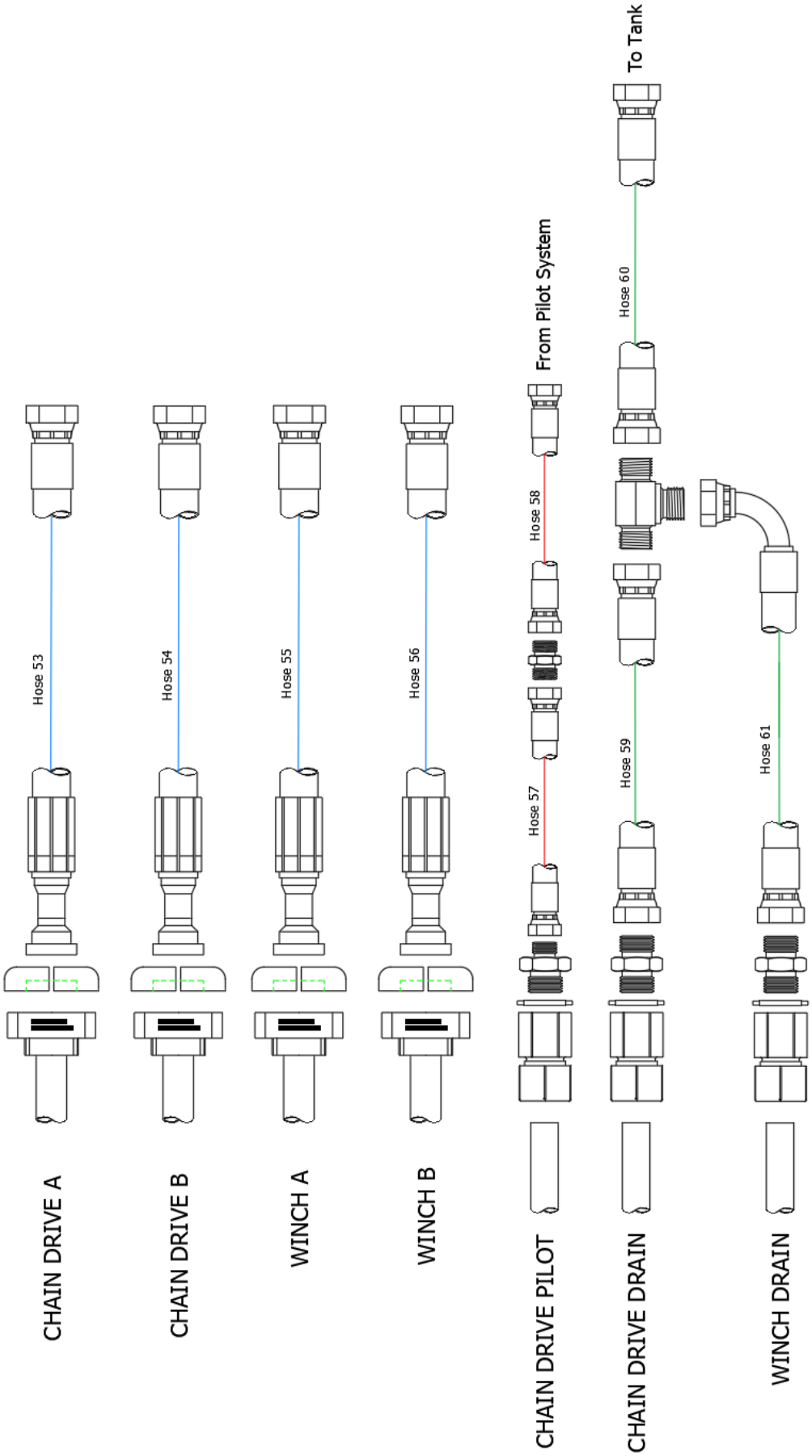
Rotate Ram



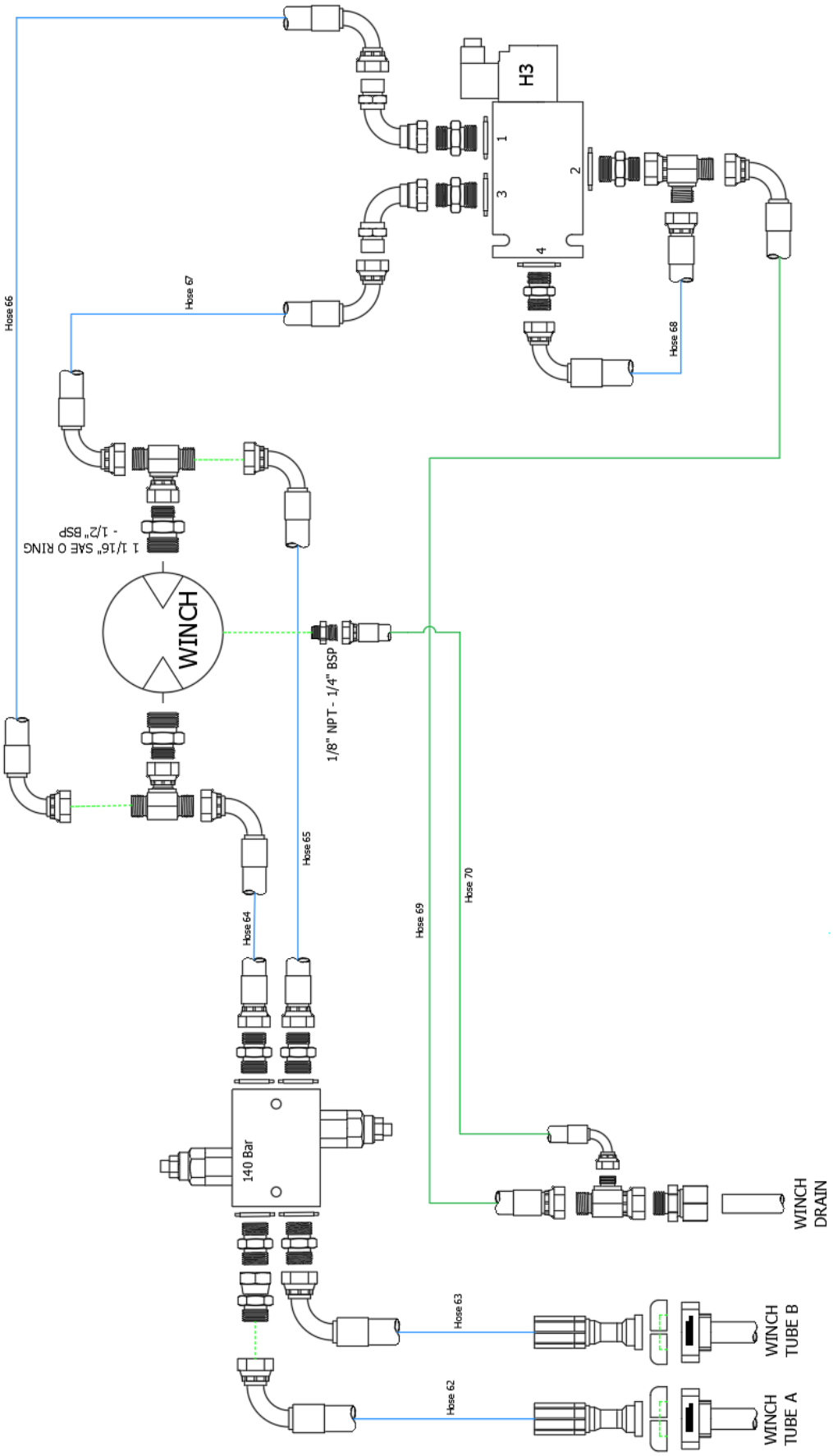
Chain Tensioner



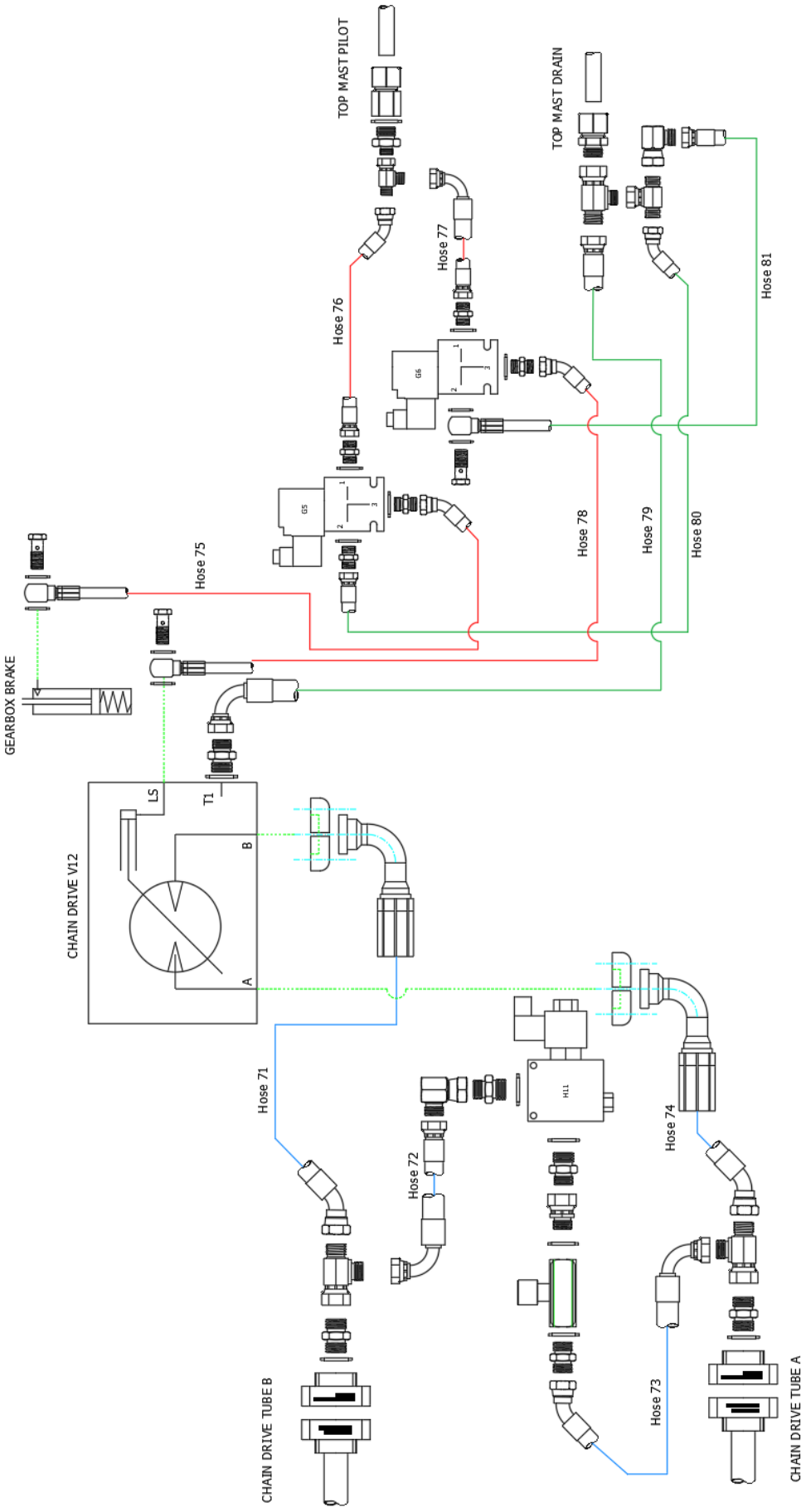
Cab Side Mast Pipes



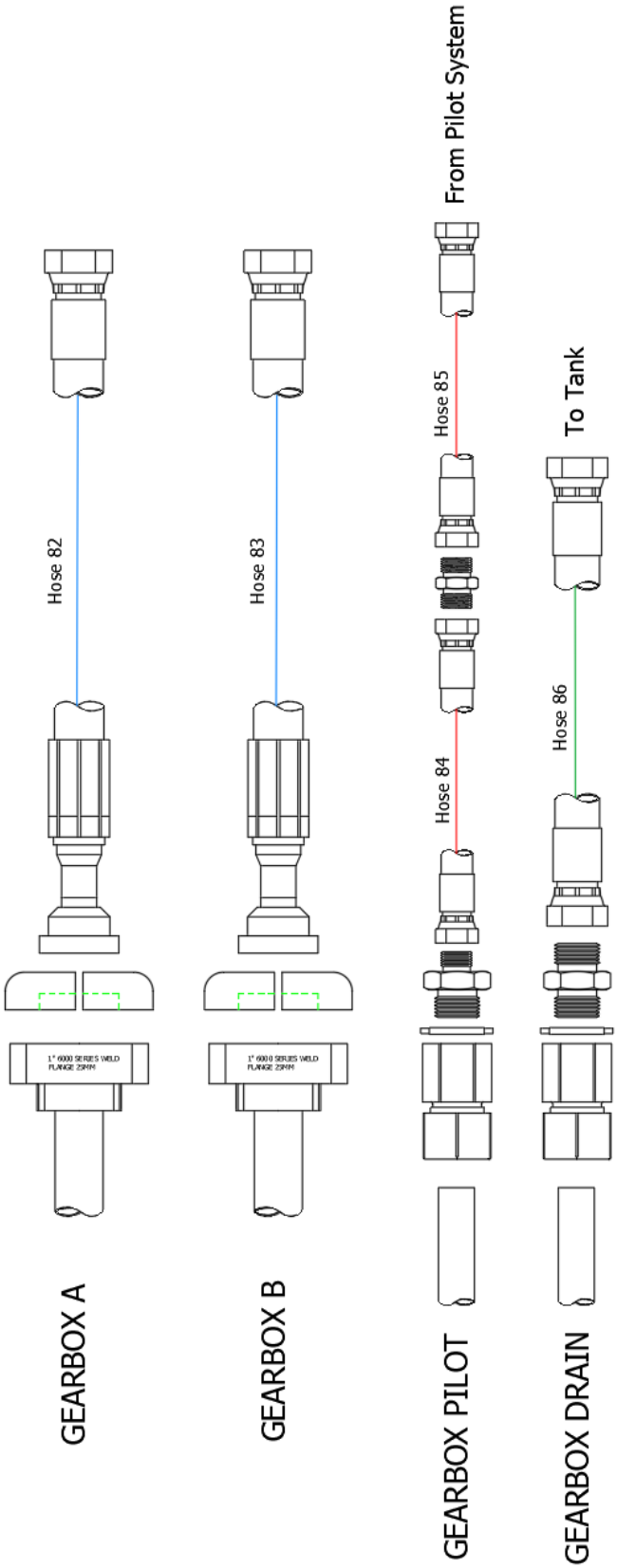
Winch


H3
1
2
3
4
Hose 66
Hose 67
Hose 68
1 1/16" SAE O RING
- 1/2" BSP
WINCH
1/8" NPT - 1/4" BSP
Hose 65
Hose 64
Hose 69
Hose 70
140 Bar
WINCH
DRAIN
Hose 63
WINCH
TUBE B
Hose 62
WINCH
TUBE A

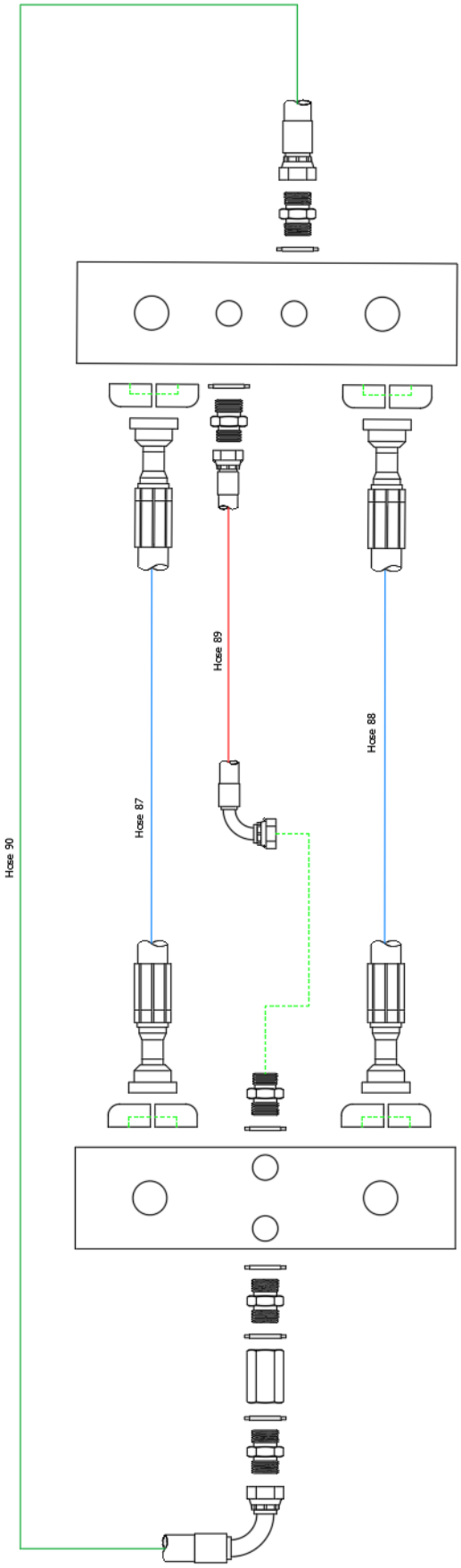
Top of Mast


TOP MAST PILOT
TOP MAST DRAIN
Hose 76
Hose 77
Hose 81
Hose 78
Hose 79
Hose 80
Hose 75
GEARBOX BRAKE
LS
T1
B
A
CHAIN DRIVE V12
Hose 71
Hose 72
Hose 74
Hose 73
CHAIN DRIVE TUBE B
CHAIN DRIVE TUBE A

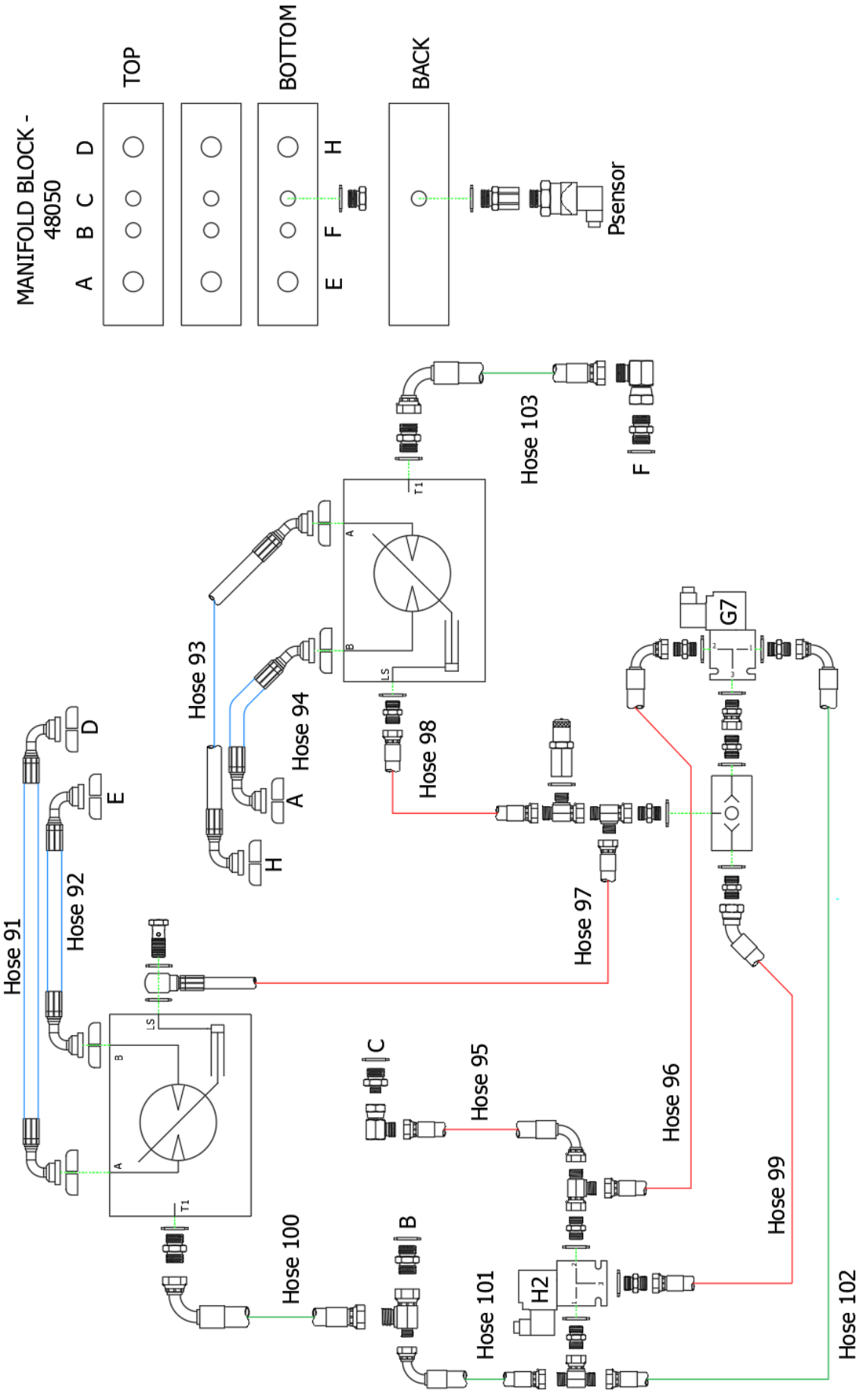
Offside Mast Pipes



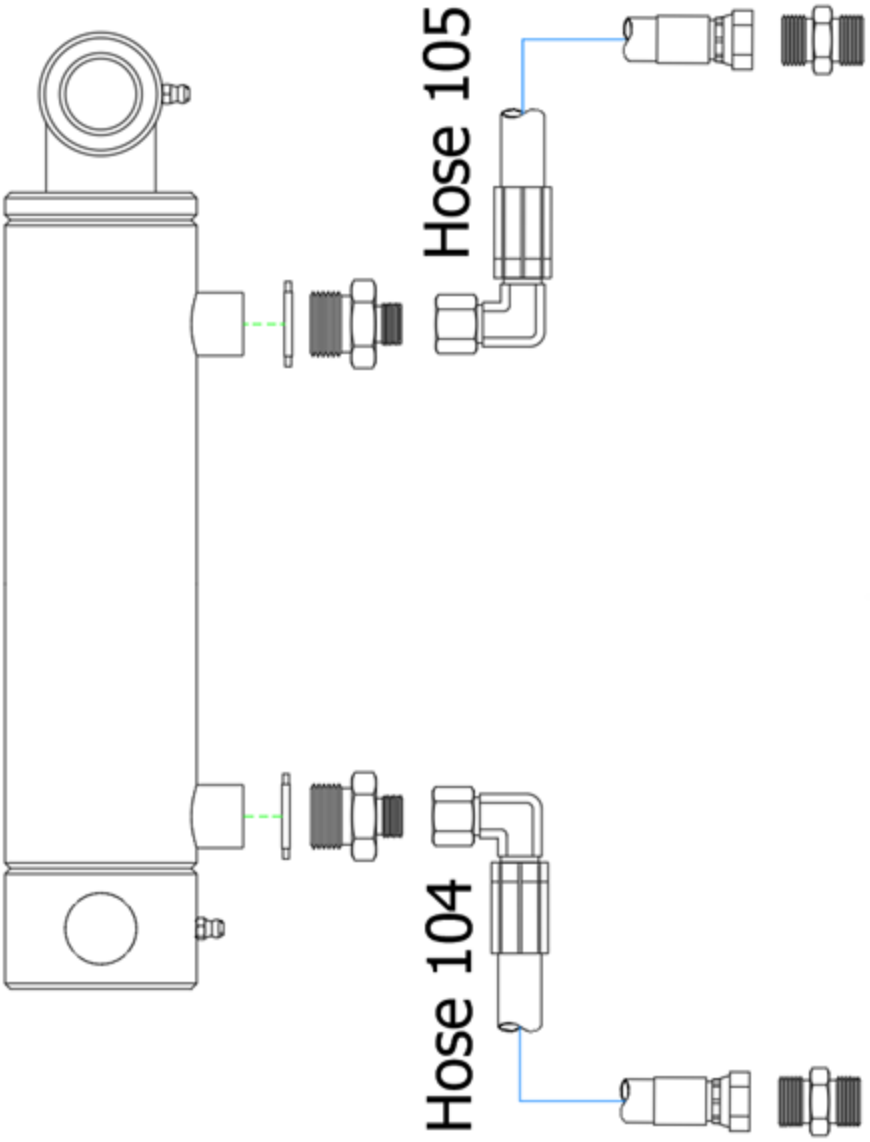
Gearbox Feed Pipes



Gearbox


MANIFOLD BLOCK - 48050
A B C D
TOP
BOTTOM
E F H
BACK
Psensor
Hose 103
F
Hose 93
Hose 94
A
H
Hose 98
G7
Hose 91
Hose 92
D
E
Hose 97
C
Hose 95
Hose 96
Hose 99
Hose 100
B
Hose 101
H2
Hose 102
LS
T1

Auger Cleaner Ram



RISK ASSESSMENT – *OPERATION OF CFA PILING RIG*

Section 1: Assessment Information

Assessment Date	27/02/2020
Activity / Item / Area	Operation of CFA Piling Rig
Person at Risk	Installation Operative and others in the work area
Total Number of People at Risk	1+
Responsible Person	Machine Operative, Installation Operative
Assessor	Adam Sandey
Reviewed and Approved by	

Section 2: Likelihood/Severity of Injury

	Significant Risks	Likelihood	Severity	Residual Risk
1.	Injury caused by impact/crushing	2	4	8
2.	Slips, trips & falls	1	3	3
3.	Manual handling	1	3	3
4.	Use of hand tools	2	1	2
5.	Injury caused by rotation	3	4	12

Likelihood		Severity				
		Minor	Serious	Major	Fatality	Multiple Fatalities
		1	2	3	4	5
Rare	1	1	2	3	4	5
Unlikely	2	2	4	6	8	10
Moderate	3	3	6	9	12	15
Likely	4	4	8	12	16	20
Certain	5	5	10	15	20	25

Low Risk	Moderate Risk	Significant Risk	High Risk

Likelihood X Severity = Residual Risk

Section 3: Control Measures

1)	Appropriate PPE is worn including hard hat, eye glasses, gloves and high-visibility clothing as a minimum. Ear protection may be required when operating or working in close proximity to certain excavator models
2)	Machine Operatives will maintain a line of sight with the machine at all times
3)	Hands will be kept away from connecting parts. Connecting parts such as pins will be maintained in good order. Safety clips and other appropriate fittings will be used at all times
4)	Operators will ensure that all unauthorised persons are kept away from the work area, by bounding off the area if practicable.
5)	The winch and mast will be operated in such a manner as to avoid swinging any object and any other potentially hazardous practices.
6)	The gearbox will be operated in a controlled manner to avoid potentially hazardous practises.
7)	Installation Operatives will familiarise themselves with the layout of the work area, will avoid working in poor or incomplete excavations and report any hazardous ground conditions to the Site Manager
8)	All operators to be trained in machine use and safety prior to operation.
9)	All hand tools will be kept in good order and only used for their design purpose. Faulty/broken/worn items will be replaced
10)	Operators are to be in possession of, have read and understood the machine and operation instruction manual.
11)	The customer (or their appointed agent) is to have identified and marked out all known services within the vicinity of the work area. Operators will not carry out any works until the locations of any known services are made clear
12)	Piling Rig is regularly inspected, maintained and serviced in accordance with manufacturer instructions.
13)	Pre start check carried out and any faults reported immediately.
14)	Appropriate guard fitted according to Federation of Piling Guidance on PUWER (Regulations 11&12).
15)	Guard safety switches within system to reduce gearbox speed if guard opened.

Further Action Required

NO FURTHER ACTION REQUIRED

Prepared By

Autoguide Equipment

Autoguide Equipment
Stockley Road
Heddington
Nr. Calne
Wiltshire SN11 0PS
England

Tel: +44 (0) 1380 850885

Fax: +44 (0) 1380 850010

Website: www.autoguide.co.uk